



UNIVERSIDADE DA BEIRA INTERIOR
Ciências Sociais e Humanas

**Information Systems Driven to Decision Support
and Institutions' Success in the Higher Education
Context
Exploring Key Antecedents Through a Technology
Acceptance Perspective**

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Tese para obtenção do Grau de Doutor em
Gestão
(3º ciclo de estudos)

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Covilhã, 22 de maio de 2019

Dedication

To my true friends and family who always believed in me and supported me.

Acknowledgements

I have to acknowledge the support shown by my family, specially my mother. I am very grateful for the opportunity she gave me regarding my attendance of school and higher learning. Without this encouragement and support, I would certainly not be taking this important step in my life today. To my husband João Correia, a special thanks for the support in the less good moments and the understanding for my absence. And lastly, but not least, to my supervisors, Professors Mário Franco and Luís Mendes, for the persistence, patience and dedication demonstrated over the last years.

Abstract

The main aim of this Ph.D. thesis in Management is to provide better understanding of the role of Information Systems (ISs) in the decision-making process and successful performance of Higher Education Institutions (HEIs), exploring the antecedents of technology acceptance. To achieve the objectives defined, four articles were elaborated: a Systematic Literature Review (SLR) and three articles of an empirical nature.

Therefore, the first article aimed to identify, explore and systematize the main topics regarding the role of web portals as tools to support information management in HEIs. Based on 126 articles published up to 5 November 2016 on the Web of Science and SCOPUS databases, four major topics were identified, namely, the software used in web portals, internal and external benefits of using web portals, technology acceptance and information storage and management. The main contribution of this research lies in identifying the main topics and trends in scientific production for each topic identified, and in identifying gaps and future lines of research in this field of study.

The second article aimed to study the influence of web portals in supporting HEI management and performance, considering personality traits, perceived usefulness and perceived ease of use, through an empirical study. To achieve the aim proposed, Structural Equation Modelling (SEM) was used together with a structured questionnaire administered to teaching and non-teaching staff in Portuguese HEIs. The results obtained, through 338 valid responses, indicate a positive influence of personality traits on the use of web portals and that their use also has a positive influence on HEIs' performance.

The third chapter sought to identify the factors influencing the use of e-learning platforms in the Portuguese academic context through an empirical study. A structured questionnaire was used to collect information. Based on 631 valid responses, SEM was applied, leading to the conclusion that, in accordance with Innovation Diffusion Theory (IDT), the characteristics of e-learning platforms and Personal Innovativeness in Information Technology (PIIT) have a positive influence on the use of this tool.

The fourth and final article aimed to identify and explain the factors of successful operation, implementation and use of e-libraries in the academic context of Portuguese higher education. To achieve this goal, a qualitative approach was adopted, through a case study of the e-library at the University of Beira Interior (UBI). Primary data were obtained from interviews with staff of the library, computer services and administration of this teaching institution holding leadership positions and directly involved in the implementation, maintenance or use of the e-library. The empirical evidence highlights the importance of

minimizing costs, particularly by forming cooperation protocols, the use of open-source software and training of UBI library staff.

Acceptance and use of the e-library depends on the platform's characteristics, the ease of access to information, actions to publicise and make the whole academic community aware of the e-library and its functions, and implementation of appealing, intuitive User Interfaces (UIs). In addition, the training of students and library staff was revealed as a relevant factor for acceptance of this tool. For the future, the creation of a functional search aggregator is suggested, to allow a simultaneous search in all the databases and creating the least noise possible. This function could be implemented based on multi-disciplinary teams with skills acquired through specific training. This study was based on Resource-Based View (RBV) and Social Learning Theory (SLT).

In this thesis, considering the four studies developed, it was possible to support the influence of IS acceptance on HEIs' performance and determine the role of ISs in supporting these institutions' management, in the Portuguese academic context. This research also presents contributions to theory and implications for practice, as well as future lines of study on the topic.

Key words

Decision Support, E-learning, E-library, Higher Education, Information System, Information Technology, Performance, Personality Traits, Antecedents

Resumo

O principal objetivo desta tese de doutoramento em Gestão consistiu em proporcionar uma melhor compreensão acerca do papel dos Sistemas de Informação (SIs) no processo de tomada de decisão e no sucesso da performance das Higher Education Institutions (HEIs), explorando os antecedentes da aceitação das tecnologias. Para conseguir alcançar os propósitos definidos, foram elaborados quatro artigos: uma Systematic Literature Review (SLR) e três artigos de natureza empírica.

Neste sentido, o primeiro artigo teve por objetivo a identificação, exploração e sistematização dos principais temas sobre o papel dos portais web como ferramentas para apoiar a gestão da informação nas HEI. Tendo por base 126 artigos publicados até ao dia 5 de novembro de 2016, nas bases de dados Web of Science e SCOPUS foi possível identificar quatro grandes temáticas, nomeadamente, software utilizado em Portais Web, benefícios internos e externos da utilização de Portais Web, aceitação das tecnologias e o armazenamento e gestão da informação. O principal contributo desta investigação prende-se com a identificação das principais temáticas e tendências da produção científica em cada temática identificada, bem como, a identificação de lacunas e futuras linhas de investigação dentro deste campo de investigação.

O segundo artigo teve por objetivo estudar a influência dos portais web no apoio à gestão e no desempenho das HEIs, tendo em consideração os traços de personalidade, a perceção acerca da utilidade e da facilidade de utilização, através de um estudo empírico. Para conseguir alcançar o objetivo proposto, recorreu-se ao Structural Equation Modeling (SEM) e a um questionário estruturado, dirigido a pessoal docente e não docente de HEIs portuguesas. Os resultados obtidos, através de 338 respostas válidas, indicam que existe uma influência positiva entre os traços de personalidade e a utilização dos portais web e que a sua utilização também influencia positivamente o desempenho das HEIs.

No terceiro artigo procurou-se identificar os fatores que influenciam a utilização de plataformas de e-learning no contexto académico português, através de um estudo empírico. Recorreu-se a um questionário estruturado como objeto de recolha de informação. Tendo por base 631 respostas válidas, aplicou-se o SEM e podemos concluir que, em concordância com a Teoria da Difusão da inovação (TDI), as características das plataformas de e-learning e o Personal Innovativeness in Information Technology (PIIT) influenciam de forma positiva a utilização desta ferramenta.

O quarto e último artigo teve por objetivo a identificação e explicação de fatores para o bom funcionamento, implementação e utilização de e-librarys no contexto académico do ensino superior português. Para alcançar o objetivo proposto adotou-se uma abordagem qualitativa,

através de um estudo de caso da e-library da Universidade da Beira Interior (UBI). Os dados primários obtiveram-se com recurso a entrevistas ao Staff da Biblioteca, dos Serviços de informática e da Administração desta instituição de ensino, com posições de chefia e envolvidos de forma direta na implementação, manutenção ou utilização da e-library. As evidências empíricas ressaltam a importância para a minimização de custos, nomeadamente, a celebração de protocolos de cooperação, a utilização de software open source e a formação do staff da biblioteca da UBI.

A aceitação e utilização da e-library, depende das características da plataforma, da facilidade do acesso à informação, de ações de divulgação que deem a conhecer a toda a academia a e-library e as suas funcionalidades e da implementação de User Interfaces (UIs) apelativas e intuitivas. Adicionalmente, a formação de alunos e do staff da biblioteca revelou ser um fator relevante para a aceitação desta ferramenta. De futuro sugere-se a criação de um agregador de pesquisa funcional, que pesquise em simultâneo em todas as bases de dados e crie o menor ruído possível. Esta funcionalidade será possível ser implementada com base em equipas multidisciplinares com as skills adquiridas através de formação específica. Este estudo teve por base a Resource-Based View (RBV) e a Social Learning Theory (SLT).

Neste trabalho de tese, tendo em consideração os quatro estudos desenvolvidos, foi possível sustentar a influência da aceitação de SIs no desempenho das HEIs e averiguar o papel dos SIs no apoio dado à gestão destas instituições, no contexto académico português. Esta investigação apresenta também contributos para a teoria e implicações para a prática, bem como, futuras linhas de investigação acerca da temática em estudo.

Palavras-chave

Apoio à Decisão, E-learning, E-library, Ensino Superior, Sistema de Informação, Tecnologia de Informação, Desempenho, Traços de personalidade, Antecedentes

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List of Acronyms

DIT	Diffusion of Innovation Theory
E-learning	Electronic Learning
E-library	Electronic Library
HEI	Higher Education Institution
IS	Information System
IT	Information Technology
MPCU	Model of PC Utilization
RBV	Resource-Based View
SCL	Social Cognitive Theory
SEM	Structural Equation Modelling
SLR	Systematic Literature Review
SLT	Social Learning Theory
TAM	Technology Acceptance Model
TPB	Theory of Planned Behavior
TPT	Theory of Personality Traits
TRA	Theory of Reasoned Action
UBI	University of Beira Interior
WWW	World Wide Web

CHAPTER 1

General Introduction

1.1 Justification of the topic and motivations for the study

Higher Education Institutions (HEI) play a fundamental role in society. Besides being responsible for research and exploitation of its results, thanks to cooperation with industry, these entities can make a relevant contribution to regional and local development (Rampasso et al., 2018; Tanhueco-Nepomuceno, 2018). HEIs are the driver of knowledge production in societies, of its transmission and the use of new services or processes in the business context (Friman et al., 2018).

In modern societies, Information Technology (IT) has developed exponentially, and its applications have led to improvement in individuals' daily life (Ali et al., 2014; Kaljevic, Dimitrov, Dachkinov, Kaljevic, & Dachkinov, 2018). In the academic context, IT provides benefits for the individual and for the institution itself (Marín, Inciarte, & Hernández, 2017). These tools accelerate internal processes and thereby lead HEIs to improved performance (Spiridonova, 2016). The application of Information Systems (ISs) gives a global view of these institutions' performance (Arkorful & Abaidoo, 2014; Kaljevic, Dimitrov, Dachkinov, Kaljevic, & Dachkinov, 2018) and in this way can provide tools for administration to correct less effective and efficient strategies (Talebian, Movahed, & Rezvanfar, 2014; Eze, Chinedu-Eze, & Bello, 2018).

Implementation of ISs in the HEI context has led to an expressive variety of benefits for the academic community, particularly web portals (Chen & Chengalur Smith, 2015), e-learning platforms (Santhanam et al., 2008; Oye et al., 2012; Chang, Hajiyev, & Su, 2017) and e-libraries (Schwartz, 2000; El-Waily, 2015; Umukoro & Tihamiyu, 2017), among other ISs. These systems give the administration of these institutions access to pertinent information allowing them to implement strategies correctly, leading to achievement of their objectives, and in general, to their success (Williams, 2014; Haan, 2015).

In the competitive context of HEIs, information is considered a crucial resource for correct decision-making (Haan, 2015; Jun, Shanshan, & Qian, 2018). Knowledge of their stakeholders' trends or preferences can lead organisations to more grounded and appropriate decision-making (Shen, Carswell, Santhanam, & Bailey, 2012). In order to come closer to stakeholders, HEIs have invested considerably in electronic resources and provide relevant information

through institutional websites or web portals (Chen & Chengalur Smith, 2015), with the main aim of gathering information from different sources and creating a single point of access to relevant information (Granić, Mitrović, & Marangunić, 2011).

The term portal comes from the Latin *porta*, meaning a gate or gateway, and represents a single personalized interface allowing access to resources and services in a secure, consistent and customizable way. Web portals are a specific type of IS that allow organisations to release information stored internally and externally, and give access to the necessary information for decision-making (Bajec & Krisper, 2005). It is underlined that, initially, the tool was quite limited and rudimentary, but can now incorporate search engines, ISs or other equally complex tools, allowing access to all types of information (Chen & Chengalur Smith, 2015).

However, for ISs to be used fully and for administration to obtain the desired information, academic staff must accept and use the ISs provided by the institution (Fakeeh, 2015). Although the benefits provided by IT/ISs are undeniably positive (Chen, 2015; Chen & Chengalur Smith, 2015), there is still some resistance to their use (Chen, 2015). The non-acceptance of technology is found, among other factors, in individuals' behavioural intentions (Davis, 1989). To lessen this situation, Rodgers, Negash and Suk (2005) suggest that closer visual contact with this technology can lead to greater acceptance of tools. In this study, the question of acceptance of this technology in the academic context is raised (Persico, Manca, & Pozzi, 2014; Abdullah & Ward, 2016; Abdullah, Ward, & Ahmed, 2016; Al-gahtani, 2016; Chang, Hajiyev, & Su, 2017; Hussein, 2017), so that HEI administration, through the ISs implemented, is able to obtain robust, up-to-date information.

HEIs' survival depends to a great extent on implementing the right strategies, able to attract a high number of stakeholders with the consequent increase in their funding (Haan, 2015). Therefore, HEIs must seek effective ways to promote closer relationships with stakeholders, giving them speedy, updated information, databases to archive past, but still relevant, information and above all alignment between the interests of stakeholders and those of the institution itself (Sulaiman, Zailani, & Ramayah, 2012).

According to Carcary (2007), a very small number of studies explore the impact of IT/ISs on HEIs, compared to other sectors of activity. Consequently, little is known about the habits in using these tools and their impact on institutions (Aiken & Martin, 2003; Uçak, 2007, Zhou et al., 2016). Despite their potential to give organisations better performance, empirical evidence of the impact of ISs is still scarce and inconsistent (Bravo, Santana, & Rodon, 2015). The implementation of ISs in HEIs has become common practice, but the quality, effectiveness, rate of use and the benefits of using them remain practically unknown (Sulaiman et al., 2012; Kumar & Manjunath, 2013).

Given the importance of ISs for HEI administration to obtain information, and the frequent lack of acceptance of technology among users, this relationship is topical and should be studied. Deeper study of this subject leads to identifying the causes of non-acceptance of ISs and possible solutions to the problem. In this scenario, besides its relevance, this study can be of great benefit to HEI administration by providing additional knowledge to facilitate solid decision-making based on updated, reliable information coming from implemented ISs.

This study does not only contribute theoretically to the literature on the subject but to understanding the reasons for some resistance to technology acceptance, and to some extent, proposes solutions to combat this tendency which can affect the daily work of numerous collaborators in Information Technology Departments and similar in HEIs and organisations in general.

1.2 Purpose and aims of the research

According to the contextualization presented in the previous section, the importance of acceptance of ISs and the relevance of this tool for HEI performance is evident, due to their ability to provide pertinent, updated information.

In this connection, according to Özbek, Alniaçık, Koc, Akkılıç and Kaş (2014), information and technology have become prominent resources in people's daily lives. Increased use of ISs and the information they provide has led to significant changes in societies and organisations. In the academic context, recourse to ISs is increasingly common, aiming to manage information and enhance the teaching/learning process (Tolentino, 2011). The information provided by ISs can identify gaps and helps the decision-making process (Dias, 2001). However, that process can be hindered by the sometimes negative attitude towards use and acceptance of technology (Chu, 2009).

Given the above, the main objective of this research is to provide greater understanding of the role of ISs in the decision-making process and in HEIs' successful performance, by exploring the antecedents of technology acceptance. Practically all HEIs have implemented ISs, but little is known about their quality and effectiveness or the rate of use and benefits brought to the community (Sulaiman et al., 2012). Therefore, the specific objectives considered in this research are listed below.

- (1) Identify, explore and systematize the main themes regarding the role of web portals as tools to support information management in HEIs.
- (2) Clarify the importance of web portals and ISs, both in supporting institutions' management and for university performance, considering the effect of individuals' acceptance of technology, through the TAM and the Big Five Model.

(3) Identify the factors influencing the use of e-learning platforms in the academic context.

(4) Identify the success factors of e-libraries implemented in the academic context.

2. Research Design and Methodology

This thesis was elaborated in the form of four articles/studies with different methodological approaches, including a Systematic Literature Review (SLR) and three empirical studies of a transversal nature. To achieve the various objectives defined for this research, mixed methodology was adopted. In this type of approach, qualitative and quantitative forms are combined, since they are two approaches with complementary characteristics in presenting the results (Creswell, 2009; Povee & Roberts, 2015).

The quantitative approach prioritizes numerical indications, the frequency and intensity of the behaviour of individuals in a given population. In this research the main focus is objectivity, and the description and representation of data is carried out through statistical treatment (Creswell, 2009). The qualitative approach is used to reveal tendencies of thought and opinions and deepen issues (Yin, 2002; Hammarberg, Kirkman, & De Lacey, 2016). This is an exploratory type of research and aims to clarify the underlying reasons, opinions and motivations leading to an event. Exploratory research establishes criteria, methods and techniques to perform the study and aims to provide information about the subject studied (Yin, 2013).

Concerning the context and the sample, this research was carried out in Portuguese HEIs/universities situated in the north (University of Trás-os-Montes and Alto Douro), centre (University of Aveiro and University of Beira interior) and south (University of the Algarve) of the country, so as to obtain the greatest diversity of responses possible (Banerjee & Chaudhury, 2010).

The first article consists of an SLR following the stages proposed by Tranfield, Denyer and Smart (2003). These authors are the most quoted in the area of Social Sciences and consider that the stages of i) planning the review, ii) carrying out the review and iii) disseminating the results obtained are determinant in elaborating an SLR. With this type of study, it was possible to identify, assess and analyse the main topics within the context studied.

The next two articles are of an empirical and quantitative nature. Data treatment was performed using Amos and SPSS vs. 24 software and Structural Equation Modelling (SEM). According to Hair, Hult, Ringle and Sarstedt (2014), SEM is a statistical modelling technique allowing the analysis of complex relationships, in which the observed variables represent a small number of "latent constructions" that cannot be measured directly, but only inferred

from the former. Data collection to elaborate these articles was a crucial phase, given the slowness of the process.

The fourth article forming the thesis is of a qualitative nature and consists of a case study of an e-library. According to Yin (2013), the case study can be an important methodological strategy for research in Social and Human Sciences. The case study allows the researcher to go deeper into the phenomenon studied, revealing nuances that are difficult to discover through simple direct observation. Moreover, the case studied here favoured a holistic view with information being gathered *in loco*, through semi-structured interviews, analysis of secondary data and direct observation.

Since this research used a mixed methodological approach and is formed of four articles with different methodologies, Table 1 presents the methodological profile of each study.

Table 1: Methodological Profile of the Articles Presented

Chapter 2	Article 1
Study title	Web Portals as Tools to Support Information Management in Higher Education Institutions: A Systematic Literature Review
Objective	Identify, explore and systematize the main themes regarding the role of web portals as tools to support information management in HEIs
Approach	Conceptual, qualitative and empirical
Data-collection techniques	Search on the SCOPUS and Web of Science databases (secondary data)
Data-analysis techniques	Mapping of themes through VosViewer vs. 1.6.5 software
Sample	126 articles
Chapter 3	Article 2
Study title	Influence of Web Portals on Management Support and University Performance: Perspective of Acceptance and Use of Information Technology
Objective	Clarify the importance of web portals and ISs, both in supporting institutions' management and for university performance, considering the effect of individuals' acceptance of technology, through the TAM and the Big Five Model
Approach	Quantitative
Data-collection techniques	Questionnaire
Data-analysis techniques	Descriptive statistics using SPSS vs. 24 software Structural Equation Modelling using Amos vs. 24 software
Sample	338 teaching and non-teaching staff at Portuguese HEIs
Chapter 4	Article 3
Study title	Application of Innovation Diffusion Theory to the E-Learning Process: Higher Education Context
Objective	Identify the factors influencing the use of e-learning platforms in the academic context
Approach	Quantitative
Data-collection techniques	Questionnaire
Data-analysis techniques	Descriptive statistics using SPSS software vs. 24 Structural Equation Modelling using Amos vs. 24 software
Sample	631 students at Portuguese HEIs

Table 1: Methodological Profile of the Articles Presented (cont.)

Chapter 5	Article 4
Study title	Success Factors of E-Libraries in the Higher Education Context: A Case Study
Objective	Identify the factors leading to the success of this platform
Approach	Qualitative
Data-collection techniques	Interview, non-participant observation and documentary analysis
Data-analysis techniques	Content analysis
Sample	10 participants who are currently working at UBI: 6 belonging to the Library Staff, 2 to IT Services and 2 to the Administration of this institution

Source: Own elaboration

3. Theoretical Foundation

This research adopted various theories that are fundamental to understand the acceptance and use of the IT studied. Those theories are presented below, justifying their relevance for this study.

3.1 Theory of Reasoned Action and Theory of Planned Behaviour (TPB)

The acceptance and use of IT is a subject that has caught the attention of researchers and professionals in the area of Computing and ISs, since a well-developed system can be used more, setting out from the assumption that good software solutions can give organizations and their users competitive advantages (Al-Mamary, Al-nashmi, Hassan, & Shamsuddin, 2016a). Therefore, understanding why people use or reject IT has become one of the most challenging research topics in the area of ISs (Saleem, Beaudry, & Croteau, 2011; Verma, Bhattacharyya, & Kumar, 2018).

One of the first theoretical perspectives to be widely accepted in the literature on acceptance of IT is the Theory of Reasoned Action (TRA)(Fishbein & Ajzen, 1975). TRA is a behavioural theory that models the relationships between attitudes and behaviours (Jen, Lu, & Liu, 2009). This theory defines the relations between beliefs, attitudes, norms, intentions and behaviours. So a given behaviour, for example, the use or rejection of IT, is the result of an intention to perform the behaviour. TRA considers that people behave rationally and assess the gains or losses obtained by their attitudes (Dulloo, Mokashi, & Puri, 2014; Al-Mamary, Al-nashmi, Hassan, & Shamsuddin, 2016; Taherdoost, 2017). TRA assumes that individuals are rational and use the available information, assessing the implications of their behaviours (Svendsen, Johnsen, Almås-Sørensen, & Vittersø, 2011; Pantano & Di Pietro, 2012; Taherdoost, 2017). Highlighted as the main objectives of this theory are: (1) the interest in

forecasting and understanding individuals' behaviour, (2) define the intention to perform such behaviour. To understand behaviour, it is necessary to identify the determinants of behavioural intentions, such as attitudes, concerning the personal aspect, and subjective norms, which refer to social influence. It should also be pointed out that this theory draws considerations about individuals' beliefs and assessment of the consequences of their behaviour (Moutinho & Roazzi, 2010; Al-nashmi, Hassan, & Shamsuddin, 2016).

The Theory of Planned Behaviour (TPB) is the successor of TRA, and according to Ajzen (1991), TBP is a theory projected to forecast and explain human behaviour in specific contexts, for example, in information systems. Perceived behavioural control reflects the belief about access to resources and the opportunities necessary to perform a given behaviour (Dulloo et al., 2014; Al-Mamary et al., 2016). Therefore, the greater individuals' intention to adopt a given behaviour, the greater the possibility of this taking place (Taherdoost, 2017b). The behaviour is the sum of a series of cognitive and affective events, preceded by the conscious intention to act (Jen et al., 2009; Dulloo et al., 2014).

3.2 Technology Acceptance Model

Following the evolution of explanatory theories and models about IT acceptance emerges the Technology Acceptance Model (TAM) developed by Davis et al. (1989). This is one of the most quoted models in the literature on forecasting individuals' behaviour and is based on TRA (Venkatesh & Davis, 2000; Li et al., 2006; Kovaleva et al., 2013; Antoncic et al., 2014). According to Davis et al. (1989), TAM is based on the constructs of perceived usefulness and perceived ease of use. Perceived usefulness measures the degree to which individuals believe use of a system can improve their performance and perceived ease of use the degree to which individuals believe use of a system is effortless. TAM considers the existence of a direct relationship between the perceived ease of use and the perceived usefulness of IT. Users tend to use systems they consider easier to use (Davis et al., 1989; Dillon & Morris, 1996; Easley & Crant, 2008; Rosen & Kluemper, 2008; Svendsen et al., 2013; Altanopoulou & Tselios, 2017).

This model is one of the most referenced in the literature on acceptance of IT and served as a basis for constructing subsequent models (Venkatesh, Morris, Davis, & Davis, (2003). From the above, the schematization of TAM is presented (see Figure 1).

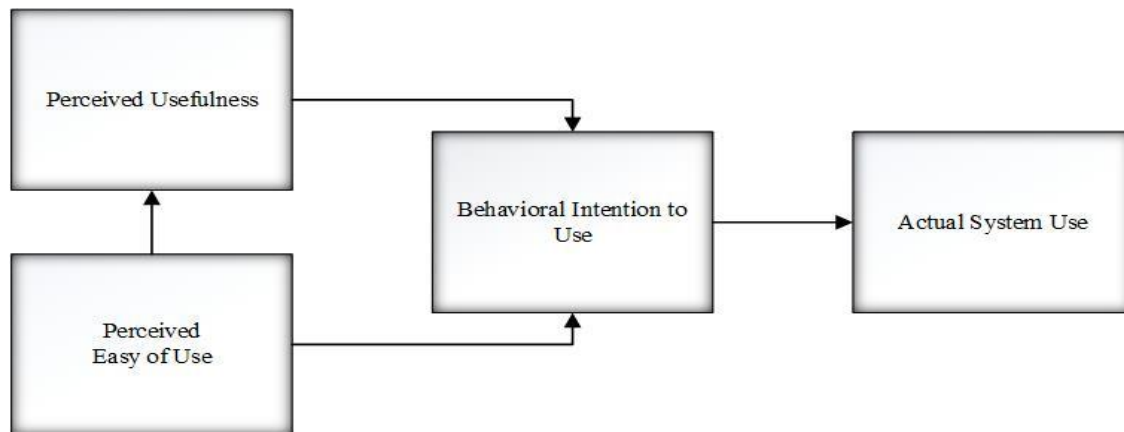


Figure 1: TAM Model

Source: Davis (1989)

This model continues to be the most quoted in the literature, as a way to forecast individuals' behaviour in the process of accepting IT (e.g., Rosen & Kluemper, 2008; Yuen & Ma, 2008; Teo, 2011; Farahat, 2012; Hu, Clark, & Ma, 2013; Svendsen et al., 2013; Altanopoulou & Tselios, 2017).

3.3 Innovation Diffusion Theory

Innovation Diffusion Theory (IDT), presented by Rogers (1962; 1995; 2003), was one of the pioneering theories in forecasting and explaining human behaviour. Innovation diffusion refers to new technology, methods or ideas and how they are disseminated and used (Dulloo et al., 2014). IDT defends that the adoption of innovations depends on the factors or characteristics of i) relative advantage, ii) compatibility, iii) complexity, iv) observability, and v) trialability, which affect individuals' attitude towards adopting the innovation (Jen et al., 2009; Sharma & Mishra, 2014). In the IT context, IDT has been used to forecast and explain acceptance of innovations and new IT (Yang, 2007; Lee et al., 2011).

3.4 Social Cognitive Theory and Social Learning Theory

Social Cognitive Theory (SCT), initially proposed by Bandura (1977), provides a structure to understand, forecast and change human behaviour. SCT states that individuals' intention to perform a certain behaviour is determined by their self-efficacy and by expectations of the results arising from that behaviour. SCT is based on Social Learning Theory (SLT) (Rotter, 1942; 1960), and indicates human behaviour being an interaction of personal, behavioural and environmental factors (Bandura, 1977). In this context, SLT, one of the first theories developed to explain learning, proposes that new behaviours can be acquired through observing and imitating other individuals. Learning is a cognitive process that occurs in a social context and can occur purely through direct observation and observation of rewards

and punishments (Attuquayefio & Addo, 2014; Chen, Lu, & Wang, 2017). Therefore, according to SLT, acceptance of IT can depend on direct observation of use of this tool (Atif & Richards, 2012; Alwahaishi & Snášel, 2013).

3.5 Theory of Personality Traits and Big-Five Model

The use of technology can also be explained by the Theory of Personality Traits (TPT) (Allport, 1937). This theory proposes that decision-making by individuals is influenced by various psychological factors, moods, emotions and personality traits (Allport, 1937; Todd & Gigerenzer, 2003). So acceptance or rejection of ISs is also based on TPT (Wilt & Revelle, 2019).

Also emerging following the evolution of theories to explain acceptance of IT based on individuals' personality is the Big-Five Model (Barrick, Mount, & Judge, 2001). This model is one of the most referenced in the literature on forecasting behaviour and considers a set of five factors (neuroticism, extroversion, agreeableness, conscientiousness and openness to experience), whose characteristics are presented in the following table. These factors affect individuals in decision-making (Barrick, Mount, & Judge, 2001; Antoncic et al., 2014; Barnett, Pearson, Pearson, & Kellermanns, 2015).

Table 2: Dimensions of personality in the Big-Five Model

Factors	Associated Traits
Neuroticism	Energy, enthusiasm, sociability, activity, assertiveness
Extroversion	Negative affectivity, nervousness, anxiety, sadness and tension
Agreeableness	Altruism, affection, trust, modesty and compassion
Conscientiousness	Control of impulses, thinking before acting, following norms and rules, planning, organising and prioritizing tasks
Openness to experience	Originality and an open mind

Source: John & Srivastava (1999); Schaick, Kovacik, Hallman, Diaz, & Morrison (2007); Barnett, Pearson, Pearson, & Kellermanns (2015)

In the IT context, the Big-Five Model has been widely used in the literature as a way to forecast individuals' behaviour in technology acceptance (e.g., Devaraj, Easley, & Crant, 2008; Rosen & Kluemper, 2008; Saleem, Beaudry, & Croteau, 2011; Punnoose, 2012; Altanopoulou & Tselios, 2017; Verma, Bhattacharyya, & Kumar, 2018).

3.6 Resource-Based View

Resource-Based View (RBV) (Barney, 1991), adopted in this research, did not aim to forecast individuals' behaviour in relation to IT acceptance. Its use aimed to obtain a broad view of

existing resources in HEIs and their possible optimization. According to RBV, competitiveness and organisational growth arise from producing or obtaining unique products, capacities and resources (Barney, 1991; Lozano, Carpenter, & Huisingsh, 2015). An organisation's competitiveness is determined by the alignment between the organisation's competences and its strategy, formulated and adopted so as to create competitive advantages (Pan, Pan, & Lim, 2015). Barney (1991) states that the resources must be valuable, in order to exploit opportunities and minimize the threats from the external environment. For organisations to be able to reach competitive advantages, the resources must also be rare, inimitable and unable to be substituted by competitors (Peteraf & Barney, 2003; Kanungo & Jain, 2012).

In this connection, technological resources are based on the capability to perform the functions of ISs. Professionals, know-how and expertise, security policies and shared data storage services are the basis of technological resources (Kamasak, 2015). Through ISs, organisations have access to pertinent, unique information, which is considered crucial for organisations to remain competitive (Ling, Tee, & Eze, 2014). So this theory was shown to be relevant for this study, in that it indicates effective management of HEIs' human, financial and technological resources.

3.6 Synthesis

In summarised form, the theories used and serving as theoretical support in elaborating this thesis are presented below (see Table 3).

Table 3: Theories Used in Elaborating the Thesis

Theory	Author(s)	Constructs
Theory of Reasoned Action (TRA)	Ajzen (1991)	Behavioural intention, Attitude, and Subjective norms
Theory of planned Behaviour (TPB)	Ajzen (1991)	Behavioural intention, Attitude, and Subjective Norm, Perceived Behavioural Control.
Technology Acceptance Model (TAM)	Davis et al. (1989)	Perceived usefulness, perceived ease of use
Innovation Diffusion Theory (IDT)	Rogers (1962)	Relative advantage, compatibility, complexity, observability and trialability
Social Learning Theory (SLT)	Rotter (1942, 1960)	Learning with others
Social Cognitive Theory (SCT)	Bandura (1977)	Outcome Expectations-performance, outcome expectations-personal, self-efficacy, affect, anxiety
Theory of personality Traits	Allport (1937)	Personality Traits
Big-Five Model	Barrick, Mount, & Judge (2001)	Neuroticism, extroversion, agreeableness, conscientiousness and openness to experience
Resource Based-View (RBV)	Barney (1991)	Resources

Source: Sharma & Mishra (2014), Venkatesh et al. (2003)

4. Structure of the Thesis, Publications and Presentations at Conferences

As already mentioned, this Ph.D. thesis in Management takes the form of articles, and is structured in six chapters. The first chapter, the introduction, covers the introductory element of the thesis. The pertinence, motivation and justification for carrying out the study is presented, together with the general and specific objectives of the research. This chapter also presents the methodology used, the methods and techniques employed in each of the four articles forming the work. The final part of this introductory chapter presents the theories serving as a basis for developing the four articles/studies.

The second chapter, formed of the article entitled “Web Portals as Tools to Support Information Management in Higher Education Institutions: A Systematic Literature Review”, consists of an SLR, whose main objective is to map and explore the topics most dealt with concerning the importance of web portals as tools to support information management in HEI management. This article is published in the International Journal of Information Management, Volume 41, August 2018, Pages 80-92, <https://doi.org/10.1016/j.ijinfomgt.2018.04.002>.

The third chapter presents the empirical study of a quantitative nature entitled “Influence of Web Portals on Management Support and University Performance: Perspective of Acceptance and Use of Information Technology”, the aim being to identify the benefits provided by the use of web portals and the performance gains arising from ISs, considering the process of accepting and using IT and users’ personality traits. This article has been submitted to Journal: Information Technology and Management and is in the process of being reviewed.

The fourth chapter contains the empirical article also of a quantitative nature, entitled “Application of Innovation Diffusion Theory to the E-learning Process: Higher Education Context”, with the main objective of identifying the factors influencing the use of e-learning platforms. This study was presented at the international conference “Cooperation and Education - IV COOPEDU”, on the subject of: Cooperation and Education of Quality, held on 8 and 9 November 2018, at the Centre for International Studies at ISCTE-IUL, in Lisbon. This article has been submitted to Journal of Higher Education and is in the process of being reviewed.

The fifth chapter contains the empirical article of a qualitative nature entitled “Success Factors of E-Libraries in the Higher Education Context: A Case Study”, which aims to identify and understand the critical factors for successful implementation, use and maintenance of electronic libraries (e-libraries). This article has been submitted to Journal: Information & Management and is in the process of being reviewed.

The sixth chapter presents the conclusions and contributions to theory and practice, together with the limitations and future lines of research.

The following figure schematizes the different parts of this Ph.D. thesis.

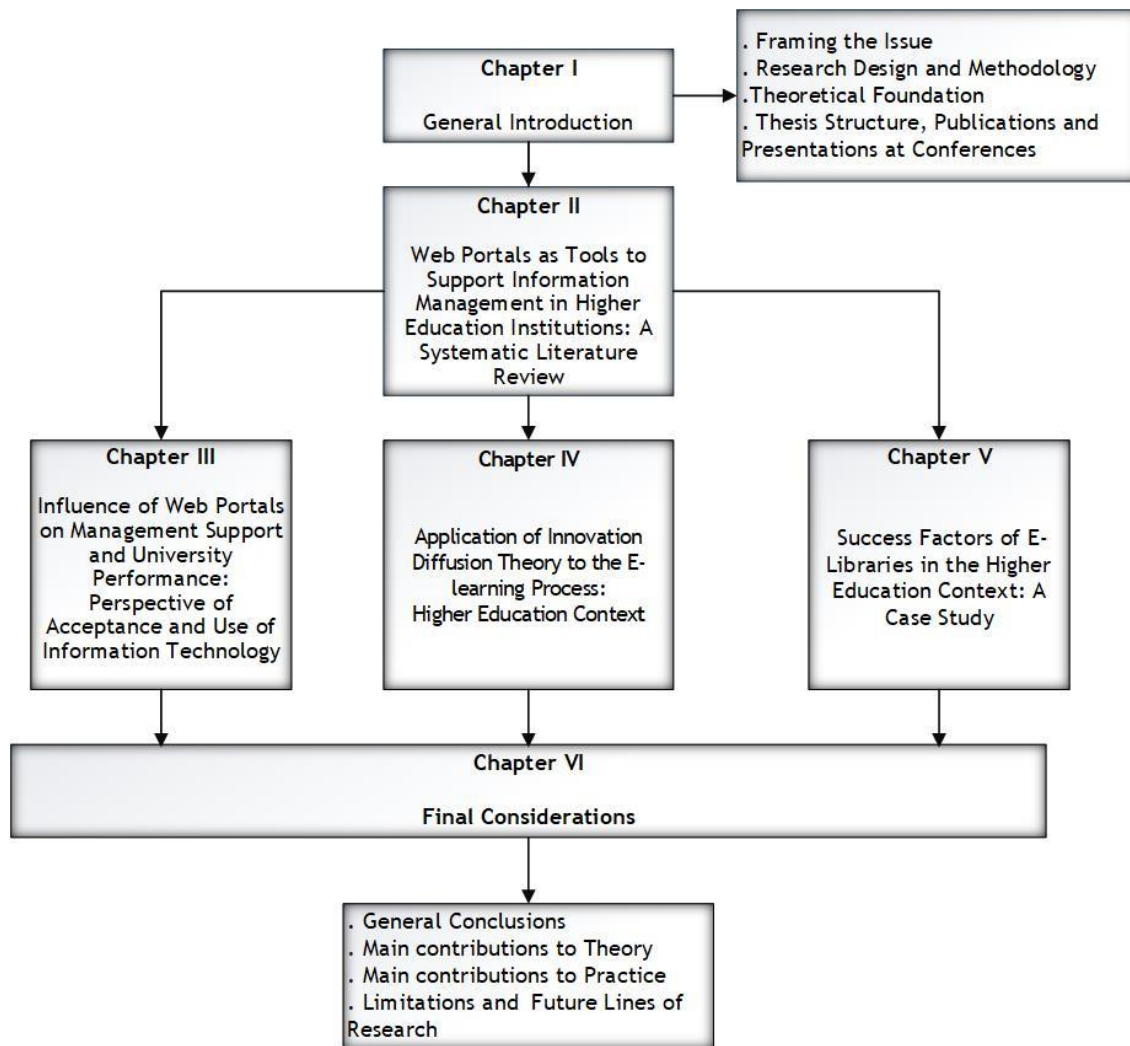


Figure 2: Thesis Structure

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CHAPTER 2

Web Portals as Tools to Support Information Management in Higher Education Institutions: A Systematic Literature Review

Abstract

Web portals have become vital for Higher Education Institutions (HEI), since they serve as an interface and communication channel between all academic staff. Therefore, this study aims to provide a systematic literature review (SLR) of the role of web portals as tools to support information management in HEIs, based on various studies published up to the present day. Based on the results obtained, it was possible to identify, explore and systematize the main themes on this topic: (1) Software used in web portals, (2) Internal and external benefits, (3) Acceptance of technology and (4) Management and storage of information. The evidence demonstrates there is a major shortage of scientific articles in the HEI context. Also revealed is the importance for these institutions of implementing a web portal appropriate to their needs, and the web portal's importance to help in decision-making. This SLR also suggests future lines of research according to the gaps identified in the theoretical corpus.

Keywords: Information Management, Higher Education Institutions, Systematic Literature Review, Web Portal and Website

1. Introduction

Due to growing globalization and internationalization, Higher Education Institutions (HEI) need to implement effective tools of information management (Melchor-Ferrer & Buendía-Carrillo, 2016). HEIs are exponentially integrating technologies that allow efficient and effective information management, making them more competitive (Bisaso, 2009).

In this context, the World Wide Web (WWW), particularly web portals, or websites, play a central role in the exchange of information between lecturers and students, facilitating the teaching/learning process. In addition, all higher education staff (both teaching and non-teaching) recognize the importance of this type of tool, for cooperation and exchanging knowledge between different HEIs (Arroyo, Hornos, & Sánchez, 2007). A web portal incorporates all an institution's information resources and applications in a single site. Therefore, a well-implemented web portal is the key to competitiveness in higher education (Jain & Chande, 2013).

Currently, in the European HEI context, web-based communication channels are widely implemented, allowing remote communication and interaction among all academia. In this way, web portals have shortened distances and revolutionized the way of teaching/learning, as well as society itself (Willis, Baron, Lee, Gozza-Cohen, & Currie, 2010).

Web portals also allow *e-learning*. In this way, HEIs provide an innovative teaching/learning method, more flexible and at a distance, making it accessible to a greater number of students (Álvarez, 2012). Here, lecturer/student communication takes place via the web, through mechanisms allowing remote interaction (Arroyo et al., 2007). However, the success of the web services provided by web portals depends on individuals' acceptance of technology. Perception of the suitability and usefulness of web portals is vital as intrinsic and extrinsic factors of these actors (Ganley, 2011).

Despite the benefits provided by websites and information technology (IT) in general, a limited number of studies explore and assess the impact of this technology in HEIs, compared to other sectors (Carcary, 2007). This shortage should be remedied, in order to understand the impact of websites on these institutions' operational performance, and thereby to be able to improve it.

Furthermore, we have no knowledge of any systematic literature review (SLR) of web portals as tools to support information management in HEIs. Therefore, this study aims to fill these gaps, identifying, exploring and systematizing the main themes, in this way contributing to enriching the literature on the subject. This SLR also contributes to highlighting the gaps, or themes, still little explored in the theoretical corpus of the various studies selected and in doing so, suggests guidelines for future research.

Regarding the structure of this research, Chapter 1 presents the introduction, indicating the objectives and stating the gaps it is aimed to fill. Chapter 2 describes the methodology and stages used to attain the objectives proposed for the research. Chapter 3 contains a description of the theoretical corpus used, characterising authors, journals and publications. The following chapter groups the publications by topics and thereby maps the theoretical corpus. Chapter 5 presents the conclusions as well as suggestions for future lines of research.

2. Methods

Various methods are used in the literature to carry out an SLR, but common to them all is the fact of being rigorous, explicit and wide-ranging (Albliwi, Antony, & Lim, 2015). This research adopted the methods of Tranfield, Denyer and Smart (2003), as they are most quoted in the area of the Social Sciences. According to these authors, the stages in elaborating an SLR are, (1) Planning the review, (2) Carrying out the review and (3) Disseminating the results obtained.

According to those stages, on 5 November 2016 a search was made of the Web of Science and SCOPUS databases using the advanced expression: Site* OR Website* OR Portal* OR Webportal* AND “Higher Education” OR HEI OR Universit* OR Polytechnic* AND “Information Management Syst*” OR “Information management”, existing on the topic, or, title, key words and abstract. The area of search was restricted to the Social Sciences, Management, Economics and Decision Sciences, and to articles, conference papers, reviews, book chapters and conference reviews, only written in English.

After this procedure the Web of Science database produced a total of 5 articles and SCOPUS 175, making a total of 180 studies extracted from these databases. Subsequently, using Endnote version (vs) x7.4 software, 4 duplicate publications were removed, leaving a total of 176.

At a later stage, the documents were studied in detail, in order to include only those set within the subject in question and contributing to its explanation and systematization. Here, 50 studies were removed, leaving a total of 126 documents. Next, using Microsoft Excel 2016 software, a graphic description of the sample was elaborated, based on the 126 studies selected. In this phase, the most frequent authors and sources on the topic were indicated, as well as the development of publications over the years studied.

Finally, based on reading of the theoretical corpus and VosViewer vs. 1.6.5¹ software, the main themes related to web portals as tools of information management in HEIs were

¹ *Free VosViewer* vs. 1.6.5 software is available at <http://www.vosviewer.com/>. It is used to construct bibliometric networks, based on journals, authors, co-citations and co-authorship relations. However, the most commonly used function of this software is data-mining, i.e.,

identified. It was therefore possible to achieve the objective proposed for this research, namely identification, exploration and systematization of the main themes of the subject studied.

3. Sample Description

This SLR analysed a total of 126 different studies, including scientific journals, proceedings, conferences, lecture notes and books. It is of note, however, that only 53 are scientific journals, corresponding to 42.06% of the theoretical corpus included in this research. The limited literature on web portals as tools supporting information management in HEIs is in line with the idea defended by Carcary (2007), who considers there is great disparity between studies made in the domain of HEIs and those made in the business sphere.

Regarding the methodology adopted in these studies, we can observe (see Diagram 1) that a considerable part of the research adopted a qualitative methodology (33 publications). Slightly less numerous were studies adopting a quantitative methodology (19 publications), and only one study, among the 126 studied, adopted a quantitative and qualitative methodology simultaneously.

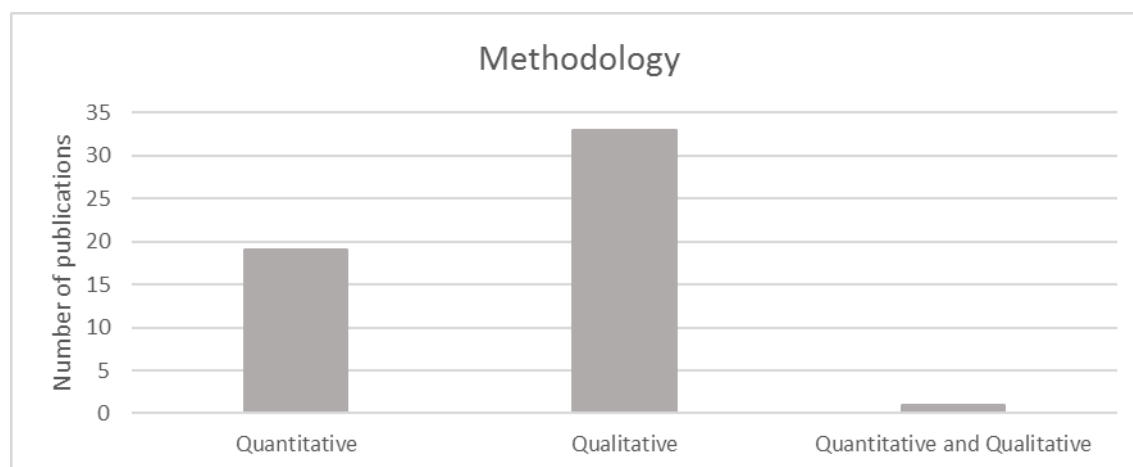


Diagram 1: Methodology adopted in the scientific articles

As for the period of publications on web portals as tools supporting information management in HEIs, this began in 1984. Analysis of Diagram 2 reveals a tendency for publications to increase from 2004, with a peak being reached in 2011 with a total of 16 publications.

identification of patterns present in a theoretical corpus. It therefore allows the construction of word co-occurrence networks existing in the set of articles studied (Source, <http://www.vosviewer.com/>).

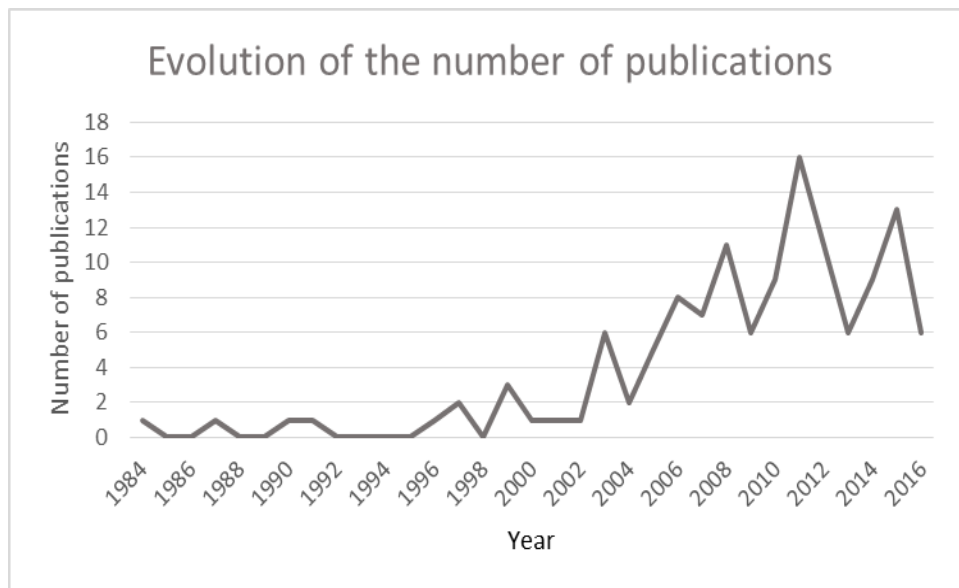


Diagram 2: Number of publications on the subject from 1984 to 2016

Concerning the authors publishing on this subject, none stands out particularly. The maximum number of publications per author was two, the remainder publishing only once. In relation to the subject studied, only three authors are found to have more than one publication (see Diagram 3).



Diagram 3: Authors with more than one publication

As for the sources dealing most with web portals as tools to support information management in HEIs, standing out are the *31st Annual ACM SIGUCCS Fall Conference* (SIGUSS Conference Proceedings), *Lecture Notes in Business Information Processing* and finally *Proceedings of the European Conference on Games-based Learning*, in *ex aequo* with five publications (see Table

1). The scientific journals included in this research published only one article. Once again, the limited literature on this subject in scientific journals is of note.

Table 1: Journals with more than one publication

Conferences	Publications
31st Annual ACM SIGUCCS Fall Conference (SIGUSS Conference Proceedings)	5
7th International Conference on Information Technology Based Higher Education, Training, ITHET	2
Campus-Wide Information Systems	2
Creating Global Competitive Economies: A 360-Degree Approach - Proceedings of the 17th International Business Information Management Association Conference, IBIMA 2011	2
ECIME 2007: European Conference on Information Management, Evaluation	2
Proceedings of the 25th International Business Information Management Association Conference - Innovation Vision 2020: From Regional Development Sustainability to Global Economic Growth, IBIMA 2015	2
Proceedings of the 8th European Conference on Information Management, Evaluation, ECIME 2014	2
Proceedings of the European Conference on Games-based Learning	5
Proceedings of the International Conference on e-Learning, ICEL	2
Subtotal	24
Scientific Journals	Publications
Education for Information	2
Electronic Library	2
Electronic Markets	4
International Archives of the Photogrammetry, Remote Sensing, Spatial Information Sciences - ISPRS Archives	2
Internet, Higher Education	2
Lecture Notes in Business Information Processing	5
Library Hi Tech News	3
Online Information Review	3
Program	2
Reference Services Review	2
VINE	2
WIT Transactions on Information Communication Technologies	2
World Transactions on Engineering Technology Education	2
Subtotal	33
Others	69
Total	126

Of the most prolific scientific journals on this subject, the one with the highest impact factor is Electronic Markets (1.404). On the other hand, the journal with the lowest impact factor is Education for Information (0.34).

Summarizing, we can conclude that, in relation to the subject analysed, publications began in 1984, and from 2004 a clearly growing tendency was recorded. However, we can also confirm limited scientific production on the theme, particularly of scientific articles using a

quantitative methodology. Of a total of 126 studies considered in this research, only 53 are of a scientific nature, accounting for 42.06% of the sample.

4. Principal Themes

To identify the principal themes arising from this SLR, Vosviewer vs. 1.6.5 software was also used for the data-mining function, aiming to identify patterns in the theoretical corpus of the 126 studies selected. It was therefore possible to ascertain the most important themes related to web portals as tools to support information management in HEIs (see Figure 1).

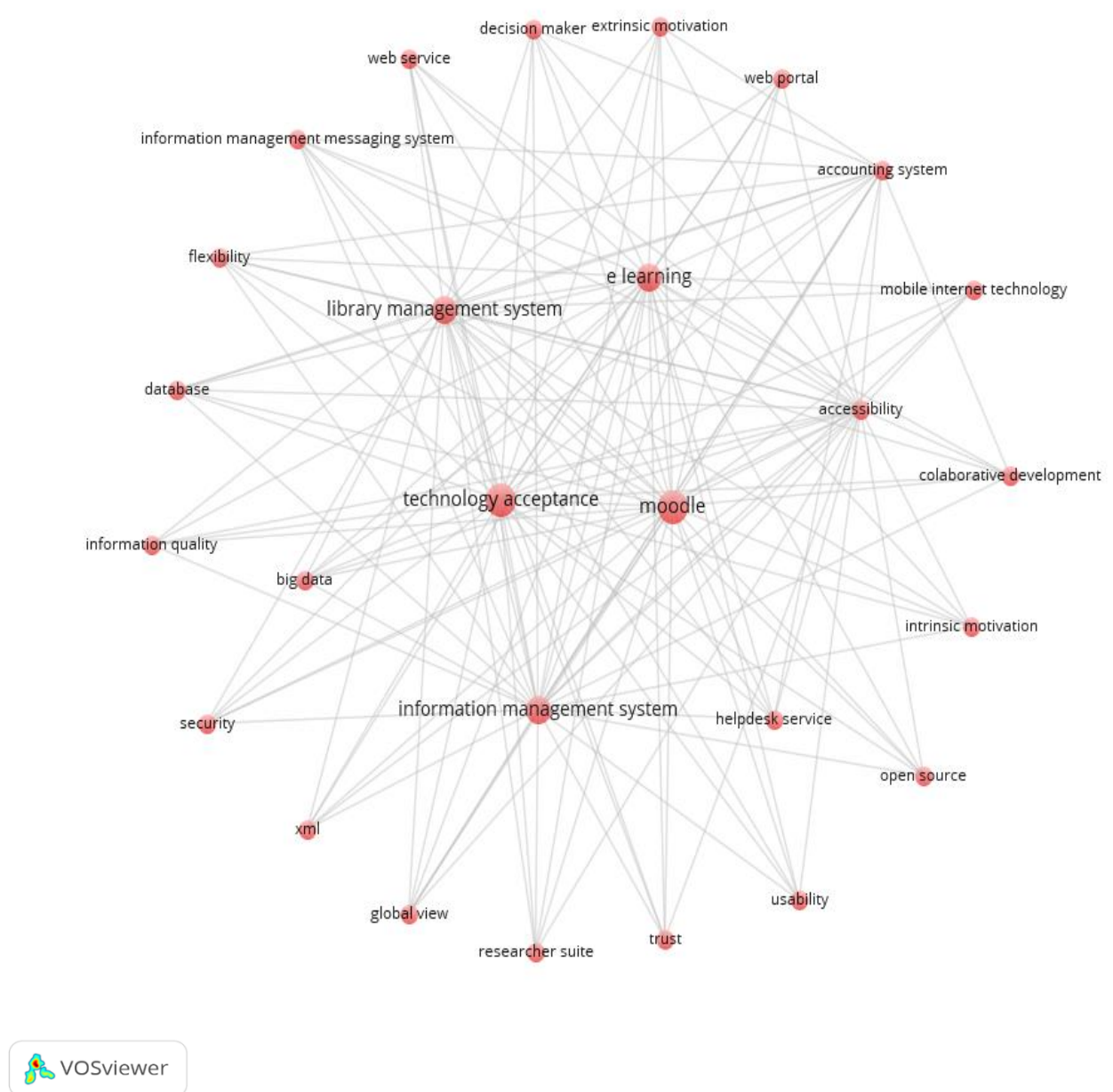


Figure 1: Network based on the number of occurrences in the title and abstract of the articles

(Source: VosViewer vs. 1.6.5)

According to Figure 1 it was possible to identify as themes: (1) Software used in web portals, (2) Internal and external benefits arising from use of web portals, (3) Acceptance of technology and (4) Management and storage of information. Therefore, in each theme the intention is to identify the main ideas, identify existing gaps and propose solutions for them, in accordance with the objective stated for this SLR.

4.1 Software used in web portals

Open and shared access to pedagogical material should be a basic human need, and one of the means to achieve this is via web portals or websites (Funk, Guthadjaka, & Kong, 2015). Nevertheless, in the process of creating or redesigning a website or web portal it is necessary to define clearly its purpose, the information to be obtained and the target public, as well as technical matters such as accessibility, usability, layout and style (Dudek & Wieczorek, 2003). This is a complex and detailed process (Ahmadi-Abkenari & Selamat, 2012; Raza & Standing, 2011; Reese, Straus, & Murray, 2004; Singh & Mahajan, 2010). In addition, the web's exponential growth has made it necessary to rethink algorithms and processes to elaborate web portals, for them to become more efficient (Ahmadi-Abkenari & Selamat, 2012; Angus, Thelwall, & Stuart, 2008).

In order to solve that problem, the process of elaborating web portals should consider the user interface (UI). This interface is the first man-machine contact and is therefore a determinant in the process of using internet services and web portals (González et al., 2013). Development of a UI that does not consider the needs and specificities of users may be condemned to failure. It is therefore necessary to provide personalized UIs, through continuous updating of these tools (Park, Jung, Shin, Kim, & Yoon, 2015). In addition, the User Experience Design (UXD) has an influence on use of the systems provided by institutions (González et al., 2013). Various models are presented in the literature on this subject. One of the most referred to is that presented by Garrett (2010), which includes not only users' practical perception of the usefulness or ease of using the systems, but also adds reasons of an effective order.

It has consequently become necessary to develop new software and accounting more appropriate to the new HEI situation (Ajayi, lyoha, & Olusanmi, 2013; Wang & Zhang, 2011). According to Figure 1 the principal software or applications are: researcher suite, *moodle*, accounting system, database and mobile internet technology, among others.

The automation of processes means less consumption of financial resources and time for these institutions. In this scenario, *Information Management Messaging System* (IMMS) stands out, in which announcements and information to HEI staff are automated (Al-Anesi & Thabit, 2012).

The development of open source software in *e-learning* environments, for mobile devices, facilitates and also increases access to education. The software most quoted in the literature and adopted by HEIs is *moodle*, which provides a vast range of functions, among them *e-learning* (Chilivumbo, 2015). Therefore, remote access to HEI databases (Changqing & Shi, 2009; Cherednichenko, Yanholenko, Iakovleva, & Kustov, 2014), for example, remote laboratory (RLAB), is a form of technology that makes the timetable of all HEI staff flexible (Bartz & Cox, 2011).

In general, the academic world has been changing its traditional form of teaching/learning to e-learning. The literature points out various benefits of this use, for both students and lecturers. E-learning allows the creation of an improved environment for the teaching/learning process and also allows efficient student management (Almrashdah, Sahari, Zin, & Alsmadi, 2010; Ijtihadie et al., 2011). In order to allow e-learning, HEIs have concentrated on the Learning Management System (LMS), meaning software packages that allow management of learning contents and collaborative resources for students online (Salmeron, 2009; Ijtihadie, Hidayanto, Affandi, Chisaki, & Usagawa, 2012). According to Zacharis (2015), the adoption of LMS by HEIs facilitates the creation of online and hybrid courses through functions for content creation, communication, assessment and management.

Furthermore, LMS allows HEI administration to upload the courses offered and subsequently include them in online catalogues, together with management of the teaching/learning timetable, the creation of online classrooms including the creation and modification of course content, the creation of examinations and questionnaires and management of discussion forums. In this way, e-learning platforms allow flexibility in the teaching/learning process (Ijtihadie et al., 2011; Dias, Hadjileontiadou, Hadjileontiadis, & Diniz, 2015).

The market provides a great variety of LMS software packages, either open-source or owned. However, HEIs concentrate on a limited number of these programs (Dobre, 2015). The three LMSs most used in the USA are Blackboard (Subramanian, Zainuddin, Alatawi, Javabdeh, & Che-Hussin, 2014), Moodle (Romero, Ventura, & García, 2008) and Canvas (www.instructure.com). However, in the European academic context, Moodle is by far the most commonly used LMS, whereas the Canvas LMS, unlike in the USA, is used less (Subramanian et al., 2014).

Despite the benefits provided to teaching by LMS platforms, the literature mentions gaps in some of that software. For example, Blackboard and WebCT focus more on the course management process than on the learning process itself. In addition, these tools do not provide insights into students' strengths and weaknesses in the learning process (Almrashdah et al., 2010).

In turn, lecturers with experience of traditional teaching can use their background in the use of e-learning, but not all do so (Almrashdah et al., 2010). While some students have skills and experience in using technology, others only acquire this as adults (Robu, 2012).

Consequently, there may be difficulties and some resistance to using these platforms, even if they can provide help about their use and the availability of contents. As a way to overcome this situation, we come back to the importance of developing flexible platforms that adapt to the needs of each user (González et al., 2013).

As they need to store a massive amount of information, and to transfer information in real time, the *e-learning* platforms (González et al., 2013) provided by web portals resort to big data technologies and mobile internet technology (Hu, 2015). Among other tools, these platforms can be provided, for example, in XML, web services (Liu, 2016), or HTML (Rjoub, Tall, Sharou, & Mardeeni, 2006), among others.

Web portals also allow implementation of library management platforms (see Figure 1), for example, ReSearcher Suite (Englert, 2010). However, for libraries to respond to users' needs, constant updating is required (Lee, Kan, & Foo, 2012).

The literature refers to various types of repositories in web portals (Hershkovitz, Azran, Hardof-Jaffe, & Nachmias, 2011; Kumar & Jumnal, 2015), for example, applications that allow master and Ph.D. students' theses to be archived in digital libraries. This facilitates search and consultation by those potentially interested in their subject matter (Grulich & Borkovcova, 2015).

However, the software quoted, used in web portals, requires maintenance and updating. Although these processes can be automated, they require planning and implementation by HEIs' IT staff (Krause, 2003). Besides, the rapid development of software and applications can lead to program contents quickly becoming out-of-date and in need of modernizing (Ghosh, Parrish, & Chasey, 2015).

In these circumstances, these tools need constant intervention by IT staff. Consequently, HEIs need specialists in diverse areas of IT to be able to respond to users' concerns in good time.

Given the limited literature of a scientific nature, Table 2 presents the main contributions of the articles identified on this subject.

Table 2: Scientific articles about the software used in web portals

Author(s)	Journal	Methodology	Contributions	Context
Angus et al. (2008)	Online Information Review	Qualitative	Investigating patterns as to the use and usefulness of tags in Flickr communities	Spain
Ahmadi-Abkenari & Selamat (2012)	Information Sciences	Quantitative	Proposal of an architecture for website research software	Technical University of Malaysia
Al-Anesi & Thabit (2012)	International Journal of Information Processing and Management	Quantitative	Proposal of software for process automation	King Abdulaziz University
Englert (2010)	Library Hi Tech News	Quantitative	Exploring the potential of ReSearcher Software for library management	Library of Tallaght Technological Institute
Funk et al. (2015)	Australian Journal of Indigenous Education	Quantitative	Exploring to what extent traditional knowledge can be made openly available	Darwin University
Ghosh et al. (2015)	International Journal of Construction Education and Research	Quantitative	Discussing the inclusion of Building Information Modeling (BIM) in students' curricular units (CUs)	Arizona State University
Lee et al. (2012)	Library Management	Qualitative	Describing the method by which the National University of Singapore library provides its services	Singapore University library
Liu (2016)	World Transactions on Engineering and Technology Education	Qualitative	Proposal of a resource management teaching model, based on XML and web services	—————
Reese et al. (2004)	Journal of Agricultural and Food Information	Qualitative	Description of the stages followed in installing and configuring an information system based on a web portal	Michigan State University
Singh & Mahajan (2010)	Program	Qualitative	Description of chemistry portals available on the web	Panjab University library

4.1.1. E-learning platforms

The aim of *e-learning* platforms is to support multimedia methods in education. Through these platforms/software, it is possible to provide all the information about the courses taught via the web, which leads to greater clarity regarding their objectives and programme contents (Carter, 2005; Hershkovitz & Nachmias, 2011; Kamrat & Haselbacher, 2002; Kaur & Sidhu, 2006; Van Brakel, 1999).

The *e-learning* environment gives a certain flexibility in terms of timetable (Koskinen, 2015), for both lecturers and students, freeing them for scientific research activities (Carter, 2005).

The variety of courses available is also a factor to be considered when choosing this type of teaching (Nicholson, 1999). A significant number of institutions teach courses in diverse areas, from engineering to health (Koesling, Krueckeberg, Meyer, & Matthies, 2007; Podestà, 2010). In this way, the *e-learning* platforms available from web portals also mean lower costs for these institutions, since no physical space is necessary for the teaching/learning process (Koskinen, 2015). Therefore, this learning system benefits both students and HEIs themselves.

However, the teaching system requires lecturers and students to have some knowledge of IT to be able to use the tools provided, and so there must be training to fill this gap (Tuncay & Uzunboyulu, 2011). To minimize this situation, LMS platforms provide help in using them, for both students and lecturers (González et al., 2013).

The proliferation of *e-learning* platforms, in turn, brought some complexity for HEIs (Williams, 2005). In order to fill this gap, better management of this type of teaching becomes necessary, as well as well-defined strategies by HEIs.

Summarizing, attention is drawn to the limited literature of a scientific nature (see Table 3) on *e-learning* platforms.

Table 3: Scientific articles related to e-learning platforms

Author(s)	Journal	Methodology	Contributions	Context
Carter (2005)	Teachers and Teaching: Theory and Practice	Qualitative	Implementation of technology mediating information between teachers, students and supervisors in an <i>e-learning</i> environment	-----
Hershkovitz & Nachmias (2011)	Internet and Higher Education	Quantitative	Investigating the types of hierarchical structures of online items offered to university students in web courses	University of Tel Aviv
Nicholson (1999)	Electronic Library	Qualitative	Exploring the advantages and disadvantages of <i>e-learning</i> and research resources in higher education	Scottish HEIs
Van Brakel (1999)	Electronic Library	Qualitative	Presenting factors of a diverse order to consider for the success of <i>e-learning</i> courses	African HEIs

4.1.2 Library management systems

With the emergence of the Web, libraries' focus changed from traditional to online service provision with the consequent construction of digital libraries (Harris-Pierce & Liu, 2012). Having achieved this objective, these entities concentrate on digital publication (Lefevre &

Huwe, 2013; McMurdo, Moncrieff, & Taylor, 1990). In this scenario, access to these works is facilitated for the whole academic community, who through web portals can access research databases of a scientific nature (Lefevre & Huwe, 2013).

In the HEI context, library management systems are integrated systems making them more accessible or user-friendly (Shafie, Yatim, & Othman, 2012). For the user, these systems allow a faster and more effective search for scientific documents as well as remote access to these articles (Chain-Navarro, Muñoz Cañavate, & Salido Martinez, 2008; Jevic, 1997). From the institution's point of view, this system allows effective cataloguing and management of all the bibliographic material (Broering, 1984). In the opinion of students, the library information systems provided by web portals are effective and allow rapid access to relevant information, meaning they can carry out scientific research of quality (Masrek, Jamaludin, & Mukhtar, 2010; McMinn, 2011).

Despite those benefits, access to the library's information system from the institution's web portal can be confusing, if it is not clearly visible to users (Shemberg, 2000).

With the increased number of students in HEIs, the pressure on researchers to be more active in terms of scientific publication has also increased. Therefore, scientific articles, proceedings and books proliferate on library sites (Zhang, 2015). With an increasingly overloaded system, HEIs find themselves forced to make decisions regarding choice of the best material to store and provide on their sites, since storage space is limited (Theakston, 1996).

To address the gaps identified, web portal construction should consider the users' viewpoint, so that these actors do not have doubts when using it. Regarding insufficient storage space, the virtualization of services or migration of information to the Cloud can be proposed. In this type of solution, where the LMS and data are stored on a Cloud Server, the security and accessibility of data is in the hands of the seller (Robu, 2012; Kuran, Pedersen, & Elsner, 2017). Consequently, the IT departments in HEIs reduce the maintenance necessary for this type of software and the costs of licensing and the necessary infrastructure to install this system (Robu, 2012; Dobre, 2015; Kuran et al., 2017). According to Kuran et al. (2017) this would be a desirable solution for small HEIs.

On this topic, similarly to the previous ones, there is a limited number of scientific articles, and those of a quantitative nature (see Table 4).

Table 4: Scientific articles related to library information systems

Author(s)	Journal	Methodology	Contributions	Context
Chain-Navarro et al. (2008)	Libri	Qualitative	Exploring the causes of HEIs teaching librarianship and information sciences not knowing about new employment opportunities for graduates in these areas	Spanish HEIs
Harris-Pierce & Liu (2012)	New Library World	Qualitative	Presenting the results of a survey of library and information science (LIS) school websites to determine the suitability of the number of courses supplied	52 LIS Schools in the north of the United States of America
Lefevre & Huwe (2013)	Journal of Web Librarianship	Qualitative	Determining librarians' skills for Library-based digital publishing	Libraries at the University of California-Berkeley
Masrek et al. (2010)	Library Review	Quantitative	Determining the effectiveness of the University of Technology MARA library website, based on students' opinions	University of Technology MARA (Malaysia)
McMinn (2011)	Reference Services Review	Qualitative	Review of the current level of services provided for bibliographical management applications (Endnote and RefWorks)	HEI libraries in the United Kingdom and Canada
McMurdo et al. (1990)	Online Information Review	Qualitative	Discussion about the use of electronic publications and computer-mediated communication (CMC) systems in higher education	Queen Margaret College (Scotland)
Shemberg (2000)	Reference Services Review	Qualitative	Exploring the accessibility of library sites from the university website. Investigating the relevant information on the library page.	University libraries in the United States
Theakston (1996)	International Journal of Information Management	Qualitative	Studying decision-making by those in charge of libraries. Since an exponential increase was recorded in the information managed by libraries and students' access to this	United Kingdom
Zhang (2015)	Science and Technology Libraries	Quantitative	Study about the patterns of use and research practices in higher education libraries	University of Engineering of the State of Mississippi

4.2 Internal and external benefits arising from the use of web portals

A significant part of the literature considered in this SLR deals with the benefits provided by the use of web portals in the HEI context, both for actors belonging to the institution (lecturers, students and the staff in general), and for all stakeholders (Arroyo et al., 2007; Gormly, 2003). The information and communication technology used in HEIs is considered to stimulate students' self-learning. This aspect is a determinant for success in the learning process (Kaur & Sidhu, 2006). In this connection, blogs are considered central in developing students' reading and writing skills (Álvarez, 2012).

The Helpdesk service provided by HEIs, initially run by students at the institution, came up against serious difficulties due to users' dissatisfaction when their problem was not solved in good time (Gormly, 2003). These institutions found it necessary to employ specialized staff and thereby improved this type of service. Only the most specific and difficult to solve situations were passed to a higher level, through the web portals. In this way, benefits are provided not only to HEIs but also externally, contributing to lowering unemployment (Gormly, 2003; Snyder, 2003).

In addition, web portals allow the implementation of various systems, namely financial management systems. It is therefore possible to optimize HEIs' existing financial resources, making them more efficient (Bisaso, 2009; Melchor-Ferrer & Buendía-Carrillo, 2016; Tianzhe & Kongpeng, 2014).

By disseminating international programmes and courses to future students, they also give relevant information to these actors. This tool allows the internationalization of teaching and making a mark in the higher education market characterised as highly competitive (Kincl, Novák, & Štrach, 2011).

With a view to globalization of teaching, the ESMOS project, with financial support from the European Commission SOCRATES/Minerva, aims to improve student mobility through online support. It is intended that students will have contact with LMS platforms and therefore overcome possible limitations in their use (Walasek, Piatkowski, Stawska, & Morawska-Walasek, 2007). In this context, LMS platforms serve as support for online teaching for students on the ERASMUS mobility programme (Papatsiba, 2005). Briefly, these platforms serve as a vehicle for teaching mobility, emerging as a consequence of globalization in the academic world.

Through this tool, the institution's image becomes known outside (Stefko, Fedorko, & Bačík, 2014). It is therefore crucial that HEIs keep their web portals updated and that they are user-friendly (Thelwall, 2004). Consequently, when constructing web portals, the first concern should be the user experience, as well as the simplicity of the interface (González et al., 2013).

These portals are also extremely important for HEIs, as they stimulate the research process by providing updated and relevant information for researchers (Warwick, Terras, Galina, Huntington, & Pappa, 2008).

Table 5 presents a summary of the scientific articles on this topic.

Table 5: Scientific articles on the benefits provided by using web portals

Author(s)	Journal	Methodology	Contributions	Context
Álvarez (2012)	RUSC Universities and Knowledge Society Journal	Qualitative	Analysis of blogs aiming to develop reading and writing skills	Spain
Melchor-Ferrer & Buendía-Carrillo (2016)	Journal of Cases on Information Technology	Qualitative	Presenting the characteristics and benefits of a web system of economic and financial information	University of Granada
Thelwall (2004)	Information Processing and Management	Quantitative	Development of methods to assess link counting techniques for groups of large university sites	HEIs in the United Kingdom, Australia and New Zealand
Warwick et al. (2008)	program	Qualitative	Investigating the importance of information resources, research centres and other digital resources in research in Higher Education	Websites of various institutions

4.2.1 Collaborative development

With globalization, HEIs tend to find joint solutions for their problems, as well as developing new technology and products (Bertini, Hansen, Matthews, Rodriguez, & Delcambre, 2009; Cook, 2014), for example, collaborative wikis ENWiC (EduNuggets Wiki Crawler) and Annoki (Annotation wiki) allow intelligent viewing of wikipedia. This is a very attractive tool for the learning process in the *e-learning* environment (Espiritu, Stroulia, & Tirapat, 2008).

The process of collaborative development also uses interdisciplinary teams located in different places. Although not new, this type of project develops the sense of leadership and self-learning in individuals involved in this type of research (Feldhusen et al., 2008; Sohn, Yoo, & Lee, 2007). This process, also called collaborative innovation, requires good management of human resources in order to maximize researchers' potential (McGarry, Cowan, & Alencar, 2010). In this way, rapid dissemination and transfer of technology is found within HEIs (Willis et al., 2010).

Given the scarce literature on this subject, Table 6 summarizes the contribution of scientific articles related to collaborative development.

Table 6: Scientific articles related to collaborative development

Author(s)	Journal	Methodology	Contributions	Context
Willis et al. (2010)	Computers in the Schools	Qualitative	Explanation of the process of collaborative creation and dissemination of information resources in higher education. This process is facilitated through the use of websites, shared repositories and open-source software.	Budapest

4.3 Acceptance of technology

Despite the benefits provided by technology and web portals, a relevant question concerns users' acceptance of that technology (Carlson & O'Cass, 2011). The most quoted model in the literature, trying to explain these actors' behaviour with regard to the use of web portals is the *Technology Acceptance Model* (TAM). According to this model, the use of, or resistance to these tools depends on the perception of usefulness and the ease of use of web portals (Bahry, Anwar, & Amran, 2012). However, resistance can be reduced through training (Lamouroux, 2008; Woodley, Fagan, & Marshall, 2014; Yang et al., 2011). Indeed, a significant proportion of users resist using web portals due to a lack of knowledge about them (Bentley, Dixon, Rozanes, & Farmer, 2003), or due to not knowing the tool's true potential (Owens & Floyd, 2005).

Users' motivations can also be classified as intrinsic or extrinsic to the individual. While some people have a natural aptitude to explore and try to understand technology, others do whatever possible to avoid it. External factors such as promotion or social pressure can be an incentive to use technology (Ganley, 2011).

In the HEI context, students with technological skills, with a critical attitude and a tendency to seek answers to questions in the academic domain are found to have better results in their academic and professional life than students without these characteristics (Gannon-Leary, Banwell, & Childs, 2001). In this context, according to Ganley (2011), the use of web portals as sources of information is a determinant.

Users' confidence is also an important matter in relation to web portal use (Salleh et al., 2012). In this situation, the very design of the portal can facilitate navigation and lead to greater user confidence in it (Gupta, Yadav, & Varadarajan, 2009). The question of privacy and information security is also a determinant in using these portals (Hausman, Debiec, Materka, Strzelecki, & Wiak, 2010; Hong & Thong, 2013).

In the same connection, and to summarize, Iqbal and Ullah (2016) and Secreto and Pamulaklakin (2015) consider that satisfaction with the functionality, efficiency, ease of use and security are decisive in the use of web portals.

Despite the use of technology being practically taken for granted in HEIs, something is still missing regarding the use of an institutional web portal. Therefore, it is vital to turn to training so that all the institution's staff can carry out their duties to the full (Lamouroux, 2008; Woodley et al., 2014).

The contributions of scientific articles identified on this topic are presented next (see Table 7).

Table 7: Scientific articles related to acceptance of technology

Author(s)	Journal	Methodology	Contributions	Context
Carlson & O'Cass (2011)	Electronic Markets	Quantitative	Study of the impact of consumers' assessment of website services in process development	Online consumers
Ganley (2011)	Electronic Markets	Quantitative	Study of the relationship between the motivations of website participants and voluntary payment for services on those websites	Members of virtual communities
Gannon-Leary et al. (2001)	Vine	Qualitative	Assessing the abilities of higher education students and HEI staff regarding literacy skills in information technology, the ability to search for information, critical capability and ability to cope with and manage information	University of Northumbria (UK)
Gupta et al. (2009)	Journal of Retailing	Quantitative	Proposal of a new perspective in approaching understanding of the formation of online trust	Online purchase environments
Hausman et al. (2010)	World Transactions on Engineering and Technology Education	Qualitative	System Description of databases for teaching and management of information	Technical University of Łódź (Poland)
Hong & Thong (2013)	MIS Quarterly: Management Information Systems	Quantitative	Conceptualization of the dimensions and factors of internet privacy concerns (IPC)	Users who resort to online purchase environments
Iqbal & Ullah (2016)	Library Hi Tech News	Qualitative	Definition of the usability of digital library websites, according to their graphic interface	University of Punjab Lahore (Pakistan)

Table 7: Scientific articles related to acceptance of technology (cont.)

Lamouroux (2008)	Education for Information	Qualitative	Description of the resources used for development of staff with information documentation functions	-----
Secreto & Pamulaklakin (2015)	Turkish Online Journal of Distance Education	Quantitative	Analysis of student satisfaction with the functionality, efficiency, appearance, ease of navigation and security of the institutional web portal	Philippine HEIs
Woodley et al. (2014)	Campus-Wide Information Systems	Qualitative	Developing a technology-based educational programme aiming to support indigenous communities, so as to protect and manage cultural heritage	University of Victoria (Australia)

4.4 Information management and storage

Increased complexity and competitiveness in HEIs' operating environment, rapid changes and development of technology and the exponential increase of the information available on the web meant HEIs had to implement effective information systems (Cobarsí, Bernardo, & Coenders, 2008; Kubicka, 2016). However, this is a complex process that must consider various factors, namely the institution's needs, size, complexity, management style and the amount of information coming from outside (Anvari & Tran, 2014; Elahi, Yu, & Annosi, 2008).

In this scenario, the web, as an instrument for spreading information, came to revolutionize the information held by individuals (Palys & Atchison, 2012). The speed, ease of access and transmission of information became a competitive advantage for organisations (Chain-Navarro et al., 2008; Matsuura, Kanenishi, Miyoshi, & Yano, 2007). Similarly, the application of technology caused significant changes in the processes and form of information management (Horváth & Rudas, 2006; Van Der Werf-Davelaar, 1999).

Web portals have the potential to become an alternative to traditional management and sharing of information within HEIs (Ettinger, 1991; Kumar & Jummal, 2015), given the capability to store and organise information (Power, 1997; Roknuzzaman & Umamoto, 2013) and provide access to it practically in real time (Garcia, Elbeltagi, Al-Husseini, & Abdelkader, 2011; Wirtz, Mory, Piehler, & Daiser, 2016).

The information management provided by web portals allows HEIs to have a global view of the various institutions and consequently gives insights in organisational terms (Effah, 2015; Nieto, 2009; Shiue & Guo, 2005; Wiggins, Remley, & Klingler, 2006). Web portals can

therefore help in these institutions' decision-making (Cobarsí et al., 2008; Quintero et al., 2012; Scholze & Maier, 2012), and in monitoring the operations they carry out (Conway, Goul, Floyd, & Vasseur, 2006).

Currently, a considerable number of teaching institutions focus on internationalization. In this context, they need to implement information systems that improve the exchange of information and the quality of services provided (Kim, Lee, & Elias, 2015; Kim et al., 2003). However, for many years, HEIs' only objective was to teach those students who met the institution's requirements and information transmission was from the lecturer to the students. Therefore, these HEIs' focus was somewhat limited (Alexa, Alexa, & Stoica, 2011).

Today, the advance of web technology leads to an abundance of information in HEIs' information systems (Setia, Richardson, & Smith, 2015; Walker Headon, 2010). Nevertheless, this situation gives rise to problems in sharing and communicating information (Jain & Chande, 2013; Rankin, Williams, & Mishelevich, 1987). Moreover, the fragmentation of information is another failing of information systems, with it sometimes being necessary to resort to additional software for efficient management of communication and information (Karger, 2007).

Although information systems are vital for HEIs' efficiency and effectiveness, from the above greater planning is necessary to implement it with the involvement of all HEIs' actors, so that IT staff have full knowledge of each unit's needs within the institution.

Summarizing, the scientific articles identified in the theoretical corpus about information management are presented below (see Table 8).

Table 8: Scientific articles about Information Management

Author(s)	Journal	Methodology	Contribution	Context
Cobarsí et al. (2008)	Campus-Wide Information Systems	Qualitative	Proposing a conceptual model of university campus information systems for students and being able to compare it with other organisations' systems	Spanish HEIs
Ettinger (1991)	Education for Information	Qualitative	Description of an innovative and multi-disciplinary post-graduate course in information management. The course in question is directed to professionals with duties in corporate and high-technology environments	-----
Kim et al. (2015)	Online Information Review	Quantitative	Identification of personal and environmental antecedents for information-sharing in social networking sites, as well as the interaction between these factors	University students in the United States of America

Table 8: Scientific articles about Information Management (cont.)

Kubicka (2016)	Foundations of Management	Qualitative	Research into the possibility of using personalized communication in the information management of online shops	Online shops
Palys & Atchison (2012)	International Journal of Qualitative Methods	Qualitative	Discussion about currently existing tools that are used in research. Namely, viral sampling strategies, wireless interviews and voice recognition transcription	-----
Rankin et al. (1987)	Academic Medicine	Qualitative	Explanation of the benefits of applying the <i>Georgia Interactive Network for Medical Information (GalN)</i>	Georgia University of Medicine
Roknuzzaman & Umemoto (2013)	VINE	Qualitative and Quantitative	Study about extending application of knowledge management in library and information science (LIS)	600 LIS Schools of the IFLA World Guide to Library
Scholze & Maier (2012)	LIBER Quarterly	Qualitative	Implementation of structured network facilitating the connection and aggregation of data and providing unique identifiers to individual researchers and organisational units	Karlsruhe Institute of Technology
Setia et al. (2015)	Electronic Markets	Quantitative	Determining the intensity with which information technology influences inter-organisational value	Car, construction sectors, among others
Shiue & Guo (2005)	Journal of Educational Media and Library Science	Quantitative	Implementation of a bibliometric system of computer-aided articles, in which these are classified, so as to create a list with a ranking of articles originating in the various departments and periodicals	Top 30 articles in the MISQ journal
Van Der Werf-Davelaar (1999)	Online and CDROM Review	Qualitative	Providing a general view of the state-of-the-art of developments and emerging infrastructure which allow identification of, and access to information published on the web	-----
Walker Headon (2010)	Library Hi Tech News	Qualitative	Implementation of the ReSearcher Suite solution, specification of the stages and benefits provided to the Institution	Technological Institute of Tallaght library
Wiggins et al. (2006)	Library Hi Tech	Qualitative	Creation of system for managing website content, specifying the architecture, components, design and methodology followed	Kent State University
Wirtz et al. (2016)	International Review on Public and Nonprofit Marketing	Quantitative	Explanation of the factors affecting the successful integration of <i>e-government</i> and citizens	Web portals in Germany

4.5 Analysis framework

Analysis of the theoretical corpus selected reveals that the existing literature on web portals as tools to support information management in HEIs can be grouped according to the following topics: (1) Software used in web portals, (2) Internal and external benefits of using web portals, (3) Acceptance of technology and (4) Information management and storage (see Figure 2).

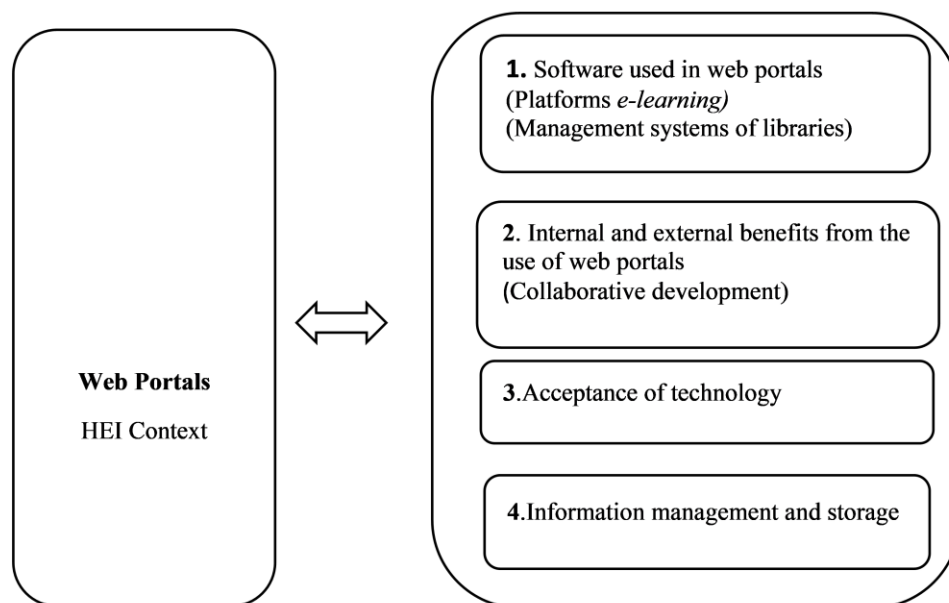


Figure 2: Analysis Framework

5. Conclusions and Suggestions for Future Lines of Research

The aim proposed for this SLR, namely the identification, exploration and systematization of the main themes regarding the role of web portals as tools to support information management in HEIs was achieved. Through detailed analysis of the theoretical corpus formed of 126 published works, and using VOSViewer vs. 1.6.5 software, the following topics were identified: (1) Software used in web portals, (2) Internal and external benefits of using web portals, (3) Acceptance of technology and (4) Information management and storage.

A factor common to all the topics identified and explored in this research was the limited number of scientific articles in the literature, as well as the limited diversity of their contexts. In addition, a considerable proportion of the articles was found to use a qualitative methodology. Therefore, it is suggested that future lines of research should follow the elaboration of scientific articles using quantitative methodology and in more diversified contexts, in order to enrich the scarce literature on the subject studied in this paper.

A significant amount of the existing literature refers to the various benefits of *e-learning* platforms and library management systems, but despite the benefits identified, some limitations could cast doubt on the success of those platforms. Therefore, a Cloud-based LMS can provide the integration, in teaching, of low-cost tools located in servers outside the institution. Tools for data storage (e.g., Dropbox), communication (e.g., Skype), sharing photographs (e.g., Flickr) and videos (e.g., YouTube) can be integrated in LMSs and in this way facilitate the teaching and learning process (Dobre, 2015). Despite the advantages mentioned, the literature is not consensual as to the advantages arising from adoption of Cloud-based LMSs. If on one hand this solution can provide protection against hackers, viruses and interference by the seller, on the other, it can bring about vulnerability in data security and privacy, since HEIs have limited control over the data (Kuran et al., 2017).

In the case of *e-learning*, the main difficulty arises from the amount of resources necessary for the system's full operation. These systems are characterised by the need for considerable storage space and the need for suitable broadband for simultaneous transmission of content to multiple users. Furthermore, specific and specialized training is necessary to gain the maximum benefit from the system.

In addition, although the subject of *e-learning* is widely debated in the literature, there is still a shortage of theory on the planning, design and implementation of these systems in HEIs. Therefore, future lines of research focusing on this topic are important in order to make it easier for HEIs to conceive these platforms.

The limited theory on *e-learning* focuses more on technological advances than on the learning process itself. So future research should study how the various types of technology have a positive influence on students' motivation to learn.

The main contribution of library management systems lies in achieving autonomy in access to information and knowledge. Despite the importance of these systems, in the current context, where teaching faces budget restrictions, it is necessary to turn to free or open-source software. This avoids the high cost of acquiring commercial software.

Also highlighted is the importance of developing UIs and software that take users' needs into account. Software customization, possible through successive updating, leads to more profitable use of these tools. Therefore, future lines of research could seek to understand the software customization process used in HEIs and the interaction between the various actors involved in this process.

The importance of web portals as tools to support decision-making in the HEI environment is highlighted. Through portals, decision-makers can gain a global vision of HEIs, existing resources and how they are being used, thereby facilitating the management process in this type of institution.

Similarly, access to relevant and updated information is the basis for the success of any HEI. Efficient and effective information management is allowed by implementation of a web portal appropriate to HEIs' needs. Therefore, the process of implementing information systems is detailed and implies the intervention of all HEI actors, since it is necessary to know institutions' real needs in advance.

Of note is the importance of technology acceptance, since resistance to using web portals can cast a doubt on information management and these institutions' success. Consequently, a proposal for future research would be studies to identify and remedy such behaviour. Only in this way will it be possible to counteract this behaviour and thereby increase this type of system's adoption rate.

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CHAPTER 3

Influence of Web Portals on Management Support and University Performance: Perspective of Acceptance and Use of Information Technology

Abstract

The objective of this study is to determine the influence of web portals on management support and performance in universities. To this end, a quantitative study was made, using SEM and a structured questionnaire, directed to teaching and non-teaching staff in Portuguese universities. The results obtained, from 338 valid responses, indicate a positive influence between personality traits and the use of web portals, and that use of this tool influences university performance positively. This research contributes to theory on this subject, explains the importance of implementing web portals and efficient Information Systems that help university administration in decision-making. These and other implications and suggestions for future research are also presented.

Keywords: Big Five Model, Information Technology (IT), Organisational Performance, Web Portal, Information Systems (IS), Technology Acceptance Model (TAM)

1. Introduction

In the current digital era, obtaining information online has become routine practice (Chen & Chengalur Smith, 2015a). In this context, organisations face new challenges related to the control and management of information which has grown exponentially in recent years. The *World Wide Web* (WWW) has rapidly become a tool for storing a massive amount of information, and content management systems allow the decentralization of processes (Riley-huff, 2009; Kumar & Manjunath, 2013; Zhou, Xia, Yin, Zhang & Zhang, 2016).

According to Bravo et al. (2015), the use of web portals is fundamental for organisations to obtain up-to-date information representing the situation as reliably as possible. However, the information obtained should be worked on to meet organisations' needs. The term portal comes from the latin *porta*, meaning door, gate or gateway. Various researchers agree it is the only personalized interface allowing access to resources, information and services in a safe, consistent and customizable way (Lara, Han, Lausen & Stollberg, 2004; Bajec & Krisper, 2005; Petrović, 2016). Web portals are applications allowing organizations to release information stored internally and externally, and allow access to necessary information for decision-making (Dias, 2001; Petrović, 2016; Patra & Dash, 2017).

Initially, this tool was quite limited and rudimentary, but now it can incorporate search engines or other equally complex tools, giving access to all types of information (Chen & Chengalur Smith, 2015b; İşeri, Uyar & İlhan, 2017). Web portals can bring significant benefits to organisations, in both individual and organisational terms (Patra & Dash, 2017). This situation occurs due to web portals allowing the integration of different sources of information, and also facilitating access to existing applications in organisations. Therefore, this tool allows access to the necessary information and knowledge for users to perform their tasks effectively (Detlor, 2000; Petrović, 2016; İşeri et al., 2017; Patra & Dash, 2017).

In turn, organisations' information is universally accepted as their main resource, and its good management and use is directly related to their performance (Buchanan & Gibb, 1998; Kumar & Manjunath, 2013). Here, web portals serve as communication channels, and the information obtained is extremely important in helping decision-making and defining strategies (Tatnall, Visscher, Finegan & O'Mahony, 2009; Petrović, 2016; Acosta & Luján-mora, 2017).

In the current academic context, with great competitiveness between HEIs, it is crucial to satisfy the greatest number of stakeholders (Bajec & Krisper, 2005; Kumar, Singh & Kumar, 2017). So these organisations should seek effective ways to promote closer relationships with stakeholders, providing them with rapid, up-to-date information, and above all alignment between stakeholders' interests and those of the institution itself (Kettunen & Kantola, 2005; Sulaiman, Zailani & Ramayah, 2012). To combat distancing from stakeholders, universities have made substantial investment in electronic resources and provided relevant information

through institutional web sites or web portals (Chen & Chengalur Smith, 2015b; Acosta & Luján-mora, 2017), whose main aim is to gather information from different sources and create a single point of access to relevant information (Granić, Mitrović & Marangunić, 2011; Petrović, 2016).

Although the benefits provided by web portals are undoubtedly positive (Chen, 2015; Chen & Chengalur Smith, 2015), there is still resistance to their use (Chen, 2015b). Acceptance of technology has been defined in the literature as the result of psychological processes experienced by users for decision-making about technology (Dillon & Morris, 1996; Armentano, Christensen & Schiaffino, 2015). This process is determined by various factors, but the literature suggests the situation is related to individuals' behavioural intention (Davis, 1989; Chomchalao & Naenna, 2013). In addition, individuals' personality traits are determinants in the process of accepting Information Technology (IT) (Nov & Ye, 2008; Prasetya, Shihab & Sandhyaduhita, 2015; Chomchalao & Naenna, 2013). That Information Technology (IT) is the technological support of Information Systems (IS), and is formed by the set of software, hardware and communications necessary to gather, process and spread information (Kumar & Manjunath, 2013; Corpuz, 2015). IT and Information Systems (IS) have been gaining relevance in the university context (Kettunen & Kantola, 2005). The information coming from IS supports decision-makers in identifying organisations' needs through a general analysis of processes (AlRababah, 2017). Based on reports from ISs, it is also possible to recognise market and stakeholder trends and patterns. Consequently, organisations can act towards achieving their objectives (DeLone & McLean, 2016), and their performance can be attained more easily (Chang & King, 2005; DeLone & McLean, 2016).

Despite the advantages claimed regarding the use of IT, namely WWW and web portals, few studies have focused on this specific topic, and consequently little is known about the habits of using these tools (Aiken & Martin, 2003; Uçak, 2007; Zhou et al., 2016). Although practically all universities have web portals, their quality and effectiveness, as well as the rate of use and the benefits brought to the community are still almost unknown (Sulaiman et al., 2012; Kumar & Manjunath, 2013). Despite the impact of ISs on organisations' performance being widely recognised in the literature, empirical evidence is still scarce and rather inconsistent (Bravo et al., 2015). Furthermore, resistance to change, in the field of IT, has been approached as the result of certain situations in particular and not as an aspect of individuals' personality (Nov & Ye, 2008; Armentano et al., 2015).

Given this inconsistency, this study aims to fill the gaps mentioned and contribute to developing the literature about the benefits provided by using web portals, as well as examining the performance gains arising from ISs, considering the process of IT acceptance and use and users' personality traits.

In the current context where IT has a major presence in most universities, understanding the acceptance and use of IT is determinant for the success of both these institutions and their

individuals/actors (Xu, Frey, Fleisch, & Ilic, 2016; Zhou et al., 2016). So the aim of this study is to clarify the importance of web portals and ISs, both for universities' performance and to support their management, considering the effect of individuals' acceptance of technology.

The article is structured as follows. The second section presents the relationship between web portal use, the support given to management and university performance, considering individuals' personality traits and acceptance of technology. The third section describes the methodology used. The following section presents and discusses the empirical results obtained. The conclusion highlights the main contributions of this research to theory and practice and some future lines of study on this subject are suggested.

2. Literature Review and Development of the Research Hypotheses

2.1 Web portals as IT in universities

In the current era of globalization, organisations are faced with the need to innovate continuously and remain flexible. In this context, the adoption of IT is important for organisations to move in this direction. In this scenario of a struggle for their very survival, organisations are forced to adopt IT, and universities are no exception (Soliman & Karia, 2017). These institutions depend on the information made available to operate and provide quality services to the academic community (Rogerson, 2013; Zhou et al., 2016).

The Web provides online users with an enormous quantity of electronic information. In this context, various web portals have emerged aiming to supply forums for communication between the members of online communities (Puspita & Rohed, 2018). Web portals present users with relevant information according to their preferences or areas of interest (Lara, Han, Lausen & Stollberg, 2004; Petrović, 2016). According to Al-Debei, Jalal & Al-Lozi (2013), a web portal is a single point of access providing users with personalized information about a given interest. The ubiquitous nature of the web and the great availability of instruments to access it easily mean that universities' web portals are a resource greatly used by the academic community. In fact, it is the principal source when searching for information (Bahry et al., 2012; Petrović, 2016). In this context, in order to make the search for information more efficient and precise, Lee, Lee, Kim, Jung & Sung (2010) propose the implementation of web portals with incorporated search engines, also integrating semantic analysis of the results found.

Web portals represent one of the principal means in the teaching process, providing forums for group discussion, electronic resources and e-learning platforms for the whole academic community (Bahry et al., 2012). However, it is of note that the information created, spread and consumed through IT in general, and through web portals in particular, is a crucial

element for universities' good functioning, more than the technology itself (Rogerson, 2013; Petrović, 2016).

Web portals have developed and are currently able to incorporate a vast range of software and platforms, as well as ISs (Al-Mudimigh, Ullah, & Alsubaie, 2011; Ivashchuk, Konstantinov, Mamatov, Udovenko, & Koskin, 2016). For example, the e-learning platforms of *moodle* and *blackboard*, now incorporated in various institutional web portals allow university administration to obtain patterns regarding student success (Romero, Ventura, & García, 2008; Subramanian et al., 2014). Web portals have become a vital tool for both students and university lecturers and administrators. The information obtained from ISs facilitates the processes of planning, control, coordination and decision support (Chapman & Kihn, 2009; Krishnaveni & Meenakumari, 2010).

Although IT can greatly facilitate users' tasks, acceptance of technology usually implies some reluctance. If some users choose e-commerce and make payments online, others consider it risky and prefer to do things personally (Leong, Jaafar, & Sulaiman, 2017). While some users describe their lives on social networks, others prefer to keep their personal lives to themselves (Chang & Yang, 2013). The reluctance to divulge sensitive data is always a controversial factor in using IT (Behrenbruch, Söllner, Leimeister, & Schmidt, 2013).

In the academic context, there is a preference for physical and direct contact in accessing information, rather than resorting to web portals. According to Lukaitis and Davey (2009), this situation occurs due to a lack of trust in IT. In addition, there is an interest in very specific information, and use of the web portal, in general, is recorded at critical stages of the school year (Lukaitis & Davey, 2009; Kumar & Manjunath, 2013).

2.2 Research hypotheses

1) Influence of personality traits on the perception of usefulness and ease of use of IT

Following the evolution of theories and explanatory models of IT acceptance, the Model of PC Utilization (MPCU) emerges. This model is based on the Theory of Human Behavior (THB) and differs from the Theory of Planned Behavior (TPB), in that it distinguishes the cognitive and affective aspects of attitudes (Triandis, 1989; Atif, Richards, & Busch, 2015). According to THB, behaviour is determined by what individuals would like to do (attitudes), what they think should be done (social norms), what they usually do (habits) and the expected consequences of the behaviour adopted (Jen, Lu, & Liu, 2009; Ramos, 2014). Based on THB, Thompson, Higgins and Howell (1991) applied this model in the IT context, aiming to forecast individuals' acceptance and use of personal computers (PCs).

Social Cognitive Theory (SCT) also highlights that part of individuals' acquisition of knowledge can be directly related to direct observation of others, in the context of social interactions (Wood & Bandura, 1989; Bandura, 1999; Middleton & Raeside, 2018). According to Viswanath Venkatesh et al. (2003), this theory/model has also been applied in the IT context, aiming to predict users' behaviour regarding the acceptance and use of technology.

Various factors influence individuals in the acceptance of IT. However, personality traits affect these agents in a particularly important way (Lam, Chiang & Parasuraman, 2008; Wu & Ke, 2015). Here, the Theory of Personality Traits (TPT) explains the influence of individuals' personality traits on decision-making (Todd & Gigerenzer, 2003; Guastello et al., 2014). Personality is defined as the individual response to particular situations and consists of a pattern of characteristics, thoughts and behaviours that distinguish people and tend to remain and be repeated over time (Guastello et al., 2014; Özbek, Alınçık, Koc, Akkılıç & Kaş, 2014). Therefore, individuals differ in their tendency to deal with new technology, and generally, acceptance involves a certain resistance to change (Nov & Ye, 2008; Prasetya et al., 2015).

The Theory of Reasoned Action (TRA) is one of the principal theories about forecasting human behaviour. Originating in social psychology, this theory defines the links between individuals' beliefs, attitudes, norms, intentions and behaviours (Viswanath Venkatesh et al., 2003; Nguyen, Hens, Macalister, Johnson, & Lebel, 2018). According to TRA, individuals' behaviour is determined by their behavioural intention to carry this out. This intention is determined by attitudes and subjective norms in relation to the behaviour. So this theory assumes that behavioural intention is the result of the sum of individuals' attitudes and subjective norms (Fishbein & Ajzen, 1975; Nguyen et al., 2018).

Based on TRA, the Technology Acceptance Model (TAM) developed by Davis et al. (1989) aims to predict users' behaviour in relation to acceptance of technology, identifying the alterations that should be implemented in technology for it to be accepted by users. TAM suggests that IT acceptance is determined by users' perception of its usefulness and ease of implementation. The perception of usefulness is defined by the authors of TAM as the degree to which users believe that using IT could improve their performance. Even if these agents are not receptive to IT, they alter their attitude and use it if they understand this can benefit them (Dillon & Morris, 1996; Devaraj, Easley & Michael Crant, 2008; Rosen & Kluemper, 2008; Svendsen et al., 2011; Svendsen et al., 2013; Özbek et al., 2014; Altanopoulou & Tselios, 2017).

In this context of resistance, the Big Five model has played a crucial role in understanding the characteristics that lead individuals to accept and use IT (Khalid, 2013; Xu et al., 2016). The model considers that the factors or dimensions are: (1) neuroticism, (2) extroversion, (3) agreeableness, (4) conscientiousness and (5) openness to experience. These factors affect

individuals' decision-making (Barrick, Mount & Judge, 2001; Antoncic et al., 2014; Barnett, Pearson, Pearson & Kellermanns, 2015).

Given the diversity of reactions regarding the acceptance of IT, it is fundamental to understand and group individuals' personality traits with influence in their choices (Reza & Khan, 2014). In this scenario, some dimensions of the Big Five model give support to clarifying individuals' personality, based on the dimensions of extroversion, conscientiousness and openness to experience (Barrick et al., 2001; Barnett et al., 2015).

Agreeableness has no significant impact on IT acceptance, since individuals with a high degree of agreeableness are not strongly motivated towards learning, and consequently, their relationship with technology is weak. Due to this situation, some studies on IT acceptance do not consider the agreeableness dimension (Barrick et al., 2001 ; Barnett et al., 2015; Pinho & Franco, 2017). Furthermore, Barrick, Mount and Judge (2001) consider that the neuroticism dimension has no significant influence on the process of choosing IT. Therefore, we will consider only the dimensions of extroversion, conscientiousness and openness to experience.

Extroversion refers to individuals' degree of ambition, as well as the search for adrenaline and stimulation (Bateman & Crant, 1993; Kovaleva et al., 2013; Prasetya et al., 2015), and covers characteristics such as shyness, assertiveness and sociability (Antoncic et al., 2014; Prasetya et al., 2015). Extroversion is a personality trait characterised by the energy transmitted by these individuals, both in performing their duties and in relations with others (Hsieh, Hsieh, & Wang, 2011 ; Prasetya et al., 2015; Altanopoulou & Tselios, 2017). Individuals with high levels of extroversion are sociable, active and value interpersonal relationships, besides achieving a higher performance in work that involves social components (Devaraj, Easley & Crant, 2008; Svendsen, Johnsen & Almås-sørensen, 2013). To maintain or improve their social status, these individuals feel motivated to adopt new IT and innovations in general (Devaraj, Easley, & Crant, 2008; Hsieh et al., 2011 ; Svendsen, Johnsen, & Almås-sørensen, 2013).

According to the Big Five Model, conscientiousness refers to the degree to which an individual is responsible, organized, careful and hardworking (Li et al., 2006, Kovaleva et al., 2013; Antoncic et al., 2014). Individuals with a high level of conscientiousness tend to accept new IT if it keeps the order of digital contents (Svendsen et al., 2013). Nevertheless, according to Xu et al.(2016), technology use depends above all on each user's personal interest in finding out about and using a new system.

The personality trait of openness to experience assumes the will to accept risks. This tendency influences individuals' assessment of risks, and as the tendency towards risk increases, the perception of risk diminishes (Tabak & Nguyen, 2013; Altanopoulou & Tselios, 2017). When faced with risky situations, agents with a high tendency towards risk have less perception of that risk and expectations of more positive results (Das & Teng, 2004; Kovaleva et al., 2013; Altanopoulou & Tselios, 2017).

It is also noted that individuals with a high tendency towards risk are open to new experiences and changes, fundamental conditions for acceptance of new IT (Devaraj, Easley, & Crant, 2008; Tabak & Nguyen, 2013). Individuals with a high tendency towards risk are therefore expected to accept web portals more readily than individuals with less of that tendency.

There is extensive literature on the influence of the personality traits present in the Big Five Model on the usefulness of IT (e.g. Easley & Crant (2008), Rosen & Kluemper (2008), Svendsen, Johnsen, & Almås-sørensen (2013) and Altanopoulou & Tselios(2017), suggesting a positive relationship between personality traits and users' perceived usefulness of IT. In the academic context, an attempt to understand the influence of personality traits presented by the Big Five Model is also found regarding the usefulness of e-learning platforms (Punnoose, 2012). From the above, and based on TRA, TAM and the Big Five Model, the following research hypothesis is presented.

H1. Personality traits have a positive influence on perception of the usefulness of institutional web portals.

The literature on technology acceptance is quite extensive (Sulaiman et al., 2012; Chen, 2015). Although there are various models and theories about the subject, the TAM model proposed by Davis, Bagozzi, & Warshaw (1989) has served as the basis for most research on the topic (Chen, 2015; Prasetya et al., 2015). On the other hand, TPB considers that behaviour is not completely voluntary and controlled, and this perspective considers the existence of control beliefs, according to which some factors can facilitate or prevent behavioural performance (Madden, Ellen, & Ajzen, 1992; Dewberry & Jackson, 2018). In the field of IT, TPB has been used aiming to understand the acceptance and use of different IT (Venkatesh et al., 2003). Based on the theories and models mentioned above, Viswanath Venkatesh et al.(2003) present a unified model for forecasting technology acceptance (UTAUT). The authors based themselves on the constructs of ease and usefulness of IT, originating in TAM (Barnett et al., 2015). Summarizing, it can be stated that despite the various models and theories in the field of IT acceptance, TAM is one of the most important and referred to (Svendsen, Johnsen, Almås-Sørensen, & Vittersø, 2011; Chang & Yang, 2013; Özbek, Almaçık, Koc, Akkılıç, & Kaş, 2014; Chen, 2015) and served as the basis for the construction of subsequent models (Venkatesh et al., 2003).

Regarding the perception of ease of use of IT, Davis et al. (1989) define this as the degree to which individuals consider using a system or IT will not require any effort. Perceived ease of use significantly influences individuals' attitude through self-efficacy. The easier a system is to use, the greater the perception of the tool's effectiveness. An easily used system gives users the feeling of control of the work done. It therefore leads those agents to motivation intrinsic to effectiveness. Moreover, their performance can be improved, since efforts are

saved to carry out other tasks (Davis et al., 1989; Rosen & Kluemper, 2008; Svendsen et al., 2013; Altanopoulou & Tselios, 2017).

The personality traits of extroversion, conscientiousness and openness indicated by the Big Five Model can lead individuals to alter their perception of the ease of using IT (Rosen & Kluemper, 2008; Svendsen et al., 2013; Altanopoulou & Tselios, 2017). In the academic context, Punnoose (2012) studies the relationship between the personality traits presented in the Big Five Model and the ease of using e-learning platforms. Therefore, based on the theories of TRA, TPB, TAM and the Big Five, the following research hypothesis is formulated.

H2. Personality traits have a positive influence on perception of the ease of using institutional web portals.

TAM also assumes the existence of a direct relationship between the ease of use and usefulness of IT. In the situation where users can choose various technologies offering the same functions, these agents will find most useful the one they consider easiest to use (Davis et al., 1989; Dillon & Morris, 1996; Easley & Crant, 2008; Rosen & Kluemper, 2008; Svendsen et al., 2013; Altanopoulou & Tselios, 2017). In the university context, some studies tried to understand the relationship between the ease of IT and its usefulness (e.g. Yuen & Ma, 2008; Teo, 2011; Farahat, 2012; Hu, Clark & Ma, 2013) and indicate a potential relationship between the ease of using IT and its usefulness. From the above, the following research hypothesis is presented.

H3. Perception of the ease of use has a positive influence on the usefulness of institutional web portals.

The use of digital systems is related to users' behaviour and measures the frequency and way in which an information system's capability or its output is accessed (Hassanzadeh, Kanaani, & Elahi, 2012; Al-Debei, Jalal, & Al-Lozi, 2013). The usefulness of IT, extensively debated in the literature on TAM, has been defined as users' perspective of digital systems regarding the services those tools provide them with. The literature indicates a positive relationship between the usefulness of IT and its use (Easley & Crant, 2008; Rosen & Kluemper, 2008; Svendsen et al., 2013; Altanopoulou & Tselios, 2017). Similarly, the perception of ease of use, present in TAM, refers to the use of digital systems being related to the level of users' efforts (Easley & Crant, 2008; Rosen & Kluemper, 2008; Svendsen et al., 2013). The literature suggests a positive relationship between the ease of using a given system and its use. In the academic environment, both usefulness (Yuen & Ma, 2008; Teo, 2008; Teo, Lee, Sing, & Luan, 2009; Teo, 2010; Hu et al., 2013) and ease of use (Yuen & Ma, 2008; Teo, 2008; Teo et al., 2009; Teo, 2010; Nair & Das, 2012; Hu et al., 2013) have been debated in TAM as potentiating IT use. Therefore, the following research hypotheses are presented.

H4. The usefulness of web portals has a positive influence on their use.

H5. The ease of using web portals has a positive influence on their use.

II) Influence of web portals on Information Systems

The use of web portals is fundamental for organisations to obtain information that is up-to-date and as credible as possible about the situation in question. The information acquired should be worked on in order to satisfy these institutions' needs (Bravo et al., 2015; Utomo, Bon, & Hendayun, 2017). However, due to rapid technological progress and the vast dissemination of information, many organisations suffer from an excess of information. Consequently, the need emerges for effective management of all the information obtained to be able to cope with the "chaos" of the digital era (Dias, 2001; Yanti Tjong & Harjanto Prabowo, 2017). In this scenario, organisations need to implement relevant, up-to-date ISs that serve their purposes completely (Kuster & Rouse, 2009; Trieu, 2017).

In the university context, web portals serve to provide information and services related to academic life (e.g. enrolments, payment of fees, displaying marks, arranging classes, etc.). Web portals are a communication channel between universities and their different stakeholders, and serve as an interface between users and the various ISs available to the academic community (Reis, Barroso, & Gonçalves, 2013; Reis et al., 2017). The most commonly referred to ISs in the university context are e-learning platforms, scientific repositories and library management platforms, among others (Utomo et al., 2017).

The quality of information provided by an IS is considered the key to this tool's success and efficiency (Bravo et al., 2015 ; Wu, Wang, & Wang, 2017). Al-Debei et al.(2013) defined quality of information as the desirable characteristics of an IS's output. Therefore the integrity of data is a critical issue in digital security and aims to avoid unauthorised access to, and destruction of information (Li, Mao, & Zdancewic, 2003). This concept is synonymous with consistency and accuracy of information (Li et al., 2003; Al-Debei et al., 2013). An IS's information must be constantly updated (timeless)(Lin & Lee, 2006; Urbach, Smolnik, & Riempp, 2010), be useful (usefulness) and well understood (understandability) by users (Urbach et al., 2010; Al-Debei et al., 2013). Another important characteristic is the possibility to customize (customization) the information in the IS (Lin & Lee, 2006). It is therefore possible to personalize the information and make it appropriate to the user's real needs (Al-Debei et al., 2013).

Since the web portal serves as an interface to access the various ISs in universities, and which in turn could contain warnings about completing or updating users' data (Al-Debei et al., 2013; Reis et al., 2013), the following research hypothesis is presented.

H6. The use of web portals has a positive influence on the quality of information in universities' ISs.

III) The influence of ISs on universities' performance

Information is considered a vital resource for any organisation, and as such must be protected from possible competitors. The decision-making process carried out according to the information available is a determinant aspect of organisations' success (Wu, Wang, & Wang, 2017); Yanti Tjong & Harjanto Prabowo, 2017). Therefore, ISs' impact on universities' performance has been widely debated in the literature (Ravichandran & Lertwongsatien, 2005; Bravo et al., 2015). ISs aim to process inputs and create outputs. In general, ISs focus on collecting, analysing, processing and spreading information, which can be sent to, and used by both users and other systems (Chang & King, 2005; Kettunen & Kantola, 2005).

ISs have the potential to provide competitive advantages, and in this way lead institutions to better performance (Ravichandran & Lertwongsatien, 2005; Wu, Wang, & Wang, 2017). According to Chapman and Kihn (2009), ISs provide greater internal transparency, allow flexibility of strategies and distribution of resources and their repair, should this be necessary. In this way, ISs can lead universities to improved performance. Well-implemented ISs that serve institutions' purposes are a means to obtaining higher performance (AlRababah, 2017).

The literature has also focused on how to measure performance, or how to measure universities' success (Kennerley & Neely, 2003; Haris, Washizaki, & Fukazawa, 2017). Organisational success refers to how organisations attain their objectives (Yamin, Gunasekaran, & Mavondo, 1999; Bryde & Leighton, 2015), and to quantifying the effectiveness and efficiency of any action (Waal & Counet, 2009; Ghosh & Das, 2014). Therefore, performance measurement systems are determinant for these institutions' success and allow decision-making based on real facts (Parker, 2000; Kumar, Pant, & Nagar, 2017), as well as correct assessment of fulfilment or exceeding pre-defined objectives. In addition, performance measurement systems have a central role in university planning and control (Kulatunga, Amaratunga & Haigh, 2007; Bryde & Leighton, 2015).

Until the 1980s, indicators to measure performance were mostly of a financial nature. More recently, such measures have been found to be insufficient and non-financial criteria/indicators have been introduced (Kennerley & Neely, 2003; Ghosh & Das, 2014; Bryde & Leighton, 2015). Nevertheless, according to Kulatunga et al. (2007), measurement of performance has shown itself to be inappropriate. This situation is due to the lack of a link with strategy, too much emphasis on financial indicators and the lack of a balanced approach and systematic thought. From the above, the following research hypothesis is proposed.

H7. *The quality of information in ISs has a positive influence on university performance.*

IV) Influence of ISs on decision support

According to the literature, information is directly related to organisations' success, and can be used as an instrument to support management (Ling et al., 2014; Kashani & Baharmast, 2017). Business Intelligence (BI) allows consolidation of the information originating in different databases (e.g. students and accounting) and includes it on a database with information that is as complete as possible (Guster & Brown, 2012). According to Kuster and Rouse (2009), BI systems provide "*one source for the truth*".

Therefore, due to the exponential increase in the information available in organisations, Business Intelligence (BI) systems have become a focus of study in the literature (Trieu, 2017). BI is defined as a system including technical and organisational elements presenting users with information for analysis, consultation and reports, allowing decision-making and support for effective management (Trieu, 2017).

Institutional administration has difficulty in accessing all the information necessary for the decision-making process (Kleesuwana, Mitatha, Yupapin, & Piyatamrong, 2010), and consequently, BI is widely used by universities to help them to access and manage large volumes of data (Zulkefli et al., 2016). BI can be of great service to institutions, namely to help in the decision-making process through elaborating reports on performance (Guster & Brown, 2012; Zulkefli et al., 2016), reduce the costs and time of the process cycle, improve communications and reduce the information overload (Urbach, Smolnik, & Riempp, 2009; Sulaiman et al., 2012).

In these circumstances, according to Devaraj & Kohli (2003), ISs have become an important tool for decision-making. Based on the information gathered, managers can decide on the most appropriate strategy to implement, and in this way focus these entities on previously stipulated objectives (Razali & Vrontis, 2010; Kashani & Baharmast, 2017). Therefore, the following research hypothesis is presented.

H8 The quality of information in ISs has a positive influence on the decision-making process in universities.

As a consequence of increased competitiveness, universities resort to new strategies and instruments in order to achieve quality in teaching and research (Druzdzal & Flynn, 2000). Therefore, the need to support decision-making has gained greater expression in universities, partly due to the increase in institutional data, i.e., due to the inability to find data in good time to support university administration in formulating policies and in decision-making (Akanmu & Jamaludin, 2015; Chanwijit et al., 2016).

Educational institutions in general and universities specifically, have adopted support for decision-making based on data, considering their values and objectives. The data necessary for an effective decision-making process, originate, in the vast majority of cases, from ISs implemented by universities or a Decision Support System (DSS) (Fakeeh, 2015; Chanwijit et

al., 2016). DSS is a digital system that can interact with users or managers aiming to help them solve structural problems (Chanwijit et al., 2016).

A significant part of the need to obtain data relates to students and employees' progress and performance, development and review of the academic plan, accompanying the implementation of programmes and policies, among other aspects (Akanmu & Jamaludin, 2015; Harrington & Libby, 2017).

Although some systems already implemented in universities incorporate modules to support decisions, this tool is inefficient due to providing only a retrospective analysis of financial or administrative data (Kostoglou, Ploskas, Vassilakopoulos, & Tsantopoulou, 2014). Therefore, the creation of efficient DSSs in the university context includes the possibility of this tool providing the amalgamation, synthesis and assessment of relevant data and information for effective decision-making (Druzdzel & Flynn, 2000).

Decision support tools are related to improved performance, as they allow supervision of academic activities and processes, as well as providing feedback for constant correction of policies and strategies implemented (Chanwijit et al., 2016; Utomo, Bon, & Hendayun, 2017). Therefore, the following research hypothesis is presented.

H9 The decision support process has a positive influence on university performance.

3. Research Methodology

3.1 Data collection and sample profile

The data-collecting instrument chosen for this quantitative research was the questionnaire, which was divided in six sub-groups of questions. The first deals with the personality traits proposed by the Big Five Model. The second sub-group of questions refers to the TAM and measures the acceptance of institutional web portals. The use of that tool was presented in the third sub-group of the questionnaire. The subsequent sections concern the quality of information on web portals, the decision support they provide, and finally, university performance.

The pre-test was carried out on 08/01/2018 and the questionnaire was administered to 8 lecturers and employees from different areas. The suggestions obtained were accepted and incorporated in the data-collecting instrument. On 22/01/2018 the questionnaires were sent online to all teaching and non-teaching staff at the universities studied.

Due to the poor response obtained in this first phase (6%), the questionnaires were applied face-to-face. This gave a total of 338 valid responses (see Table 1). The universities selected for this study were from the north (University of Trás-os-Montes and Alto Douro), centre (University of Aveiro and University of Beira Interior) and south (University of the Algarve) of

Portugal. This selection followed criteria of a geographical order, aiming to obtain a wider and more varied range of responses (Banerjee & Chaudhury, 2010). Of the total 338 valid responses, 58 were from the University of Trás-os-Montes and Alto Douro, 26 from the University of Aveiro, 220 from the University of Beira Interior and 34 responses from the University of the Algarve. The average age of respondents was 46,81 years.

Table 1: Characterization of the sample

Type of functions	Frequency	Percentage
Teaching	218	64,5
Non-teaching	120	35,5
Gender		
Female	170	50,3
Male	168	49,7
Academic qualifications		
Secondary Education	24	7,1
Degree	49	14,5
Master	63	18,6
Ph.D.	202	59,8

N=338

3.2 Measurement and scale development

The Big Five Model had most impact in the literature on individuals' personality, and includes the dimensions of neuroticism, extroversion, agreeableness, conscientiousness and openness to experience (Özbek et al., 2014; Barnett et al., 2015). In order to determine the personality traits that influence individuals in accepting institutional web portals, the study by Kovaleva et al. (2013) was referred to. So the dimensions of extroversion, conscientiousness and openness were used as those having an impact on users' choice of IT (Barrick, Mount, & Judge, 2001; Antoncic et al., 2014; Barnett, Pearson, Pearson, & Kellermanns, 2015). The items used to measure the various dimensions are systematized in Table 2.

Table 2: Measurement of constructs

Constructs	Variables	Items	Scale	Authors
	Extroversion (EX)	EX1. I am reserved EX2. I generate a lot of enthusiasm EX3. I tend to be quiet EX4. I am outgoing, sociable	1-Strongly Disagree to 7-Strongly Agree	Kovaleva et al. (2013)
Personality Traits	Conscientiousness (CS)	CS1. I do a thorough job CS2. I tend to be lazy CS3. I do things efficiently CS4. I make plans and follow through with them	1-Strongly Disagree to 7-Strongly Agree	Kovaleva et al. (2013)
	Openness (OP)	OP1. I am curious about many different things OP2. I am ingenious, a deep thinker OP3. I have an active imagination OP4. I value artistic, aesthetic experiences OP5. I have few artistic interests	1-Strongly Disagree to 7-Strongly Agree	Kovaleva et al. (2013)
TAM	Perceived Usefulness (UF)	UF1. The use of the web portal can decrease the time needed for my work/study/life tasks UF2. The use of the web portal can significantly increase the quality or output of my life UF3. The use of the web portal can increase the effectiveness of my performance UF4. The use of the web portal can increase the quality of output for the same amount of effort UF5. Considering all tasks, the use of the web portal could assist my work/study/life UF6. Overall, I find the web portal useful in my daily life	1-Strongly Disagree to 7-Strongly Agree	Lu, Yao, & Yu (2005)
	Perceived Ease of Use (EU)	EU1. I find it easy to use the web portal to find the information I need EU2. I find the web portal is easy to navigate EU3. Interacting with the web portal does not require a lot of my effort	1-Strongly Disagree to 7-Strongly Agree	Chen (2015)
	Web Portal Utilization (FQ)	FQ1. Retrieve information FQ2. Publish information FQ3. Communicate with colleagues FQ4. Store and share documents	1- Never to 7- Always	Al-Debei, Jalal, & Al-Lozi (2013)

Table 2: Measurement of constructs (cont.)

	Information System Quality (QL)	<p>QL1. The information provided by the Information Systems is accurate</p> <p>QL2. The information provided by the IS is consistent</p> <p>QL3. The information provided by the IS is reliable</p> <p>QL4. The information provided by the IS is up to date</p> <p>QL5. The information provided by the IS is useful to me in my domain of work and responsibility</p> <p>QL6. The information provided by the IS is understandable and clear</p> <p>QL7. The information provided by the IS is customizable; that is can be tailored according to my needs</p> <p>QL8. The information provided by the IS is presented in the right format</p> <p>QL9. The information provided by the IS helps me to take informed decisions</p>	1- Strongly Disagree to 7- Strongly Agree	Al-Debei, Jalal, & Al-Lozi (2013))
	Decision Support (DS)	<p>DS1. The IS allows my university administration to compare employee performance</p> <p>DS2. The IS allows my university administration to monitor performance and take corrective actions</p> <p>DS3. The IS of my university allows the administration to control the schedules and the employees' work progress</p> <p>DS4. The IS allows my university administration to ensure the timely completion of tasks</p> <p>DS5. The IS allows my university administration to control the allocation of resources by departments</p>	1- Strongly Disagree to 7- Strongly Agree	Al-Debei, Jalal, & Al-Lozi (2013)
Performance (PF)	Non-Financial Indicators	<p>PF1. The IS has helped my university to improve the efficiency of internal operations.</p> <p>PF2. The IS has helped my university to improve the quality of working results</p> <p>PF3. The IS has helped my university to enhance and improve coordination within the university</p> <p>PF4. The IS has helped my university enhance and improve collaboration within the organization.</p> <p>PF5. The IS has helped distinguish my university from similar organizations</p> <p>PF6. The IS has helped my university make itself an overall success</p>	1- Strongly Disagree to 7- Strongly Agree	Urbach et al. (2010)
	User satisfaction	<p>PF7. The IS highly supports my domain of work and responsibility</p> <p>PF8. The IS helps me to do my job with minimal resources in terms of time and effort</p> <p>PF9. The IS is useful and powerful</p> <p>PF10. I find myself generally satisfied with the IS</p>	1- Strongly Disagree to 7- Strongly Agree	Urbach et al. (2010)
	Financial Indicators	<p>FP11. The implementation of IS allowed the reduction of costs in my university</p> <p>PF12. The budget allocated to the IS / IT Department is adequate</p>	1- Strongly Disagree to 7- Strongly Agree	Pinho & Franco (2017)

To study the intention to use web portals, the TAM Model was used, considering the perception of usefulness and ease of use as determinant factors for acceptance and use of this tool. The usefulness of web portals as perceived by users refers to this tool's help in performing tasks, principally work ones, and in daily life. The scale used to measure this variable was based on the research done by Lu, Yao, & Yu (2005). This variable was measured by a set of 6 items, assessed on a Likert-type scale from 1-Strongly disagree, to 7-Strongly agree. The ease of use variable, based on the study made by Chen (2015), measures the degree to which users have to make an effort in using this tool. Ease of use was measured by 3 items on a Likert-type scale from 1-Strongly disagree, to 7-Strongly agree.

As for measurement of the use of web portals variable, the scale developed by Al-Debei, Jalal and Al-Lozi (2013) was used, measuring the frequency of using this tool. This variable was measured through a set of 4 items, on a scale from 1-never, to 7-always.

Measurement of ISs' quality of information was based on the study by Al-Debei et al. (2013), which measures integrity, timelessness, usefulness, understanding and customization of information. This variable was measured through a set of 9 items, assessed on a scale from 1-Strongly disagree, to 7-Strongly agree.

The decision support variable was operationalized through the instrument used by Al-Debei et al. (2013), which attempts to involve the situations arising from use of ISs that could help in the decision-making process. This variable was measured by a set of 5 items, assessed on a Likert-type scale from 1-Strongly disagree, to 7-Strongly agree.

Measurement of the organisational performance construct included financial (Pinho & Franco, 2017) and non-financial (Urbach et al., 2010) factors, considering, among others, measurement of performance related to the quality of service provided and user satisfaction (Urbach et al., 2010). The non-financial indicators, user satisfaction and financial indicators were measured by 6, 4 and 2 items respectively on a Likert-type scale from 1-Strongly disagree, to 7-Strongly agree.

The various scales used were subject to small adjustments so that they could be applied in the field of IT/IS and in the university context. Except for the use of web portals, the other variables were measured on a Likert-type scale from 1-Strongly disagree, to 7-Strongly agree. For the use of web portals variable, the items measure the frequency of using the web portal, assessed on a Likert-type scale from 1- Never, to 7- Always.

Reliability analysis was performed through the Cronbach Alpha (see Table 3) and Composite Reliability (CR) (see Table 5). According to Hair, Black, Babin, Anderson and Tatham (2010), coefficient values of the Cronbach Alpha and CR above 0,70 indicate acceptable internal consistency. The results indicate that the coefficients of the Cronbach Alpha values vary between 0,750 and 0,880 and that the CR values are above 0,70, and therefore acceptable

Table 3: Mean, standard deviation and Cronbach Alpha

	Mean	Standard deviation	Cronbach Alpha
Extroversion (EX)	5,741	0,540	0,775
Conscientiousness (CS)	5,720	0,391	0,831
Openness (OP)	5,614	0,641	0,757
Perceived Usefulness (UF)	5,725	0,944	0,799
Perceived Ease of Use (EU)	5,684	1,180	0,880
Use (FQ)	5,757	0,655	0,750
Quality (QL)	5,666	0,937	0,790
Decision Support (DS)	5,626	1,433	0,754
Performance (PF)	5,648	0,334	0,807

Analysis of the Pearson correlation (see Table 4) reveals a significant, linear association between the constructs at a 0,01 level of significance (two-tailed).

Table 4: Pearson correlations

	EX	CS	OP	UF	EU	FQ	QL	DS	PF
Extroversion (EX)	1								
Conscientiousness (CS)	0,476**	1							
Openness (OP)	0,711**	0,401**	1						
Perceived Usefulness (UF)	0,286**	0,560**	0,542**	1					
Perceived Ease of Use (EU)	0,487**	0,262**	0,481**	0,484**	1				
Use (FQ)	0,119*	0,190*	0,680**	0,341**	0,393**	1			
Quality (QL)	0,125*	0,582**	0,431**	0,472**	0,704**	0,480**	1		
Decision Support (DS)	0,463**	0,551**	0,189**	0,396**	0,485**	0,390**	0,543**	1	
Performance (PF)	0,145**	0,144**	0,152**	0,254**	0,268**	0,331**	0,329**	0,238**	1

Note: ** Correlation is significant at the 0.01 level (2-tailed)

* Correlation is significant at the 0.05 level (2-tailed)

4. Results

4.1 Assumptions of the analysis methods

To validate the research hypotheses, Structural Equation Modelling (SEM) was used, a very robust statistical technique that can be seen as an extension of the multiple linear regression (Diehl, 2004; McCusker & Gunaydin, 2014). From SEM, it is possible to determine the influence of several dependent variables on the independent variables, besides simultaneously testing all the relationships between the factors associated with the phenomenon studied (García-Morales, Bolívar-Ramos, & Martín-Rojas, 2013). Use of the SEM technique requires validation of a set of assumptions, without which the results of the test model could be jeopardized. Violation of the assumption of normality and linearity can cause

bias, both in the estimates of the model's parameters and in the adjustment indices (Hair et al., 2010).

The assumption of normality was tested through the analysis of measures of asymmetry [skewness (Sk) and kurtosis (Ku)]. The results revealed that the |SK| values vary between 0,106 and 0,992 and the |Ku| values between 0,137 and 0,852, therefore indicating non-violation of the assumption of normality. The assumption of linearity was tested through the Pearson correlations (see Table 4), finding significant correlations between all the variables. Therefore, non-violation of the assumption of linearity was confirmed.

According to Hair et al. (2010), variance inflation factors (VIF) ≤ 10 and tolerance values (T) $\geq 0,1$ indicate reduced multicollinearity. The results show the values of $VIF \leq 5,188$ and those of $T \geq 0,233$. Therefore, the problem of multicollinearity is also excluded.

4.2 Validation of the measurement model

Confirmatory factor analysis (CFA) was used to determine validation of the measurement model, using the maximum likelihood method for this purpose, the most commonly used method in SEM analyses (Hair et al., 2010). Observation of the output generated by IBM SPSS AMOS VS 24 software reveals whether loadings are above 0,5 ($\lambda > 0,5$) and individual reliability is equal to or above 0,25 ($R^2 \geq 0,25$) with removal of variables not in this situation (Hair et al., 2010). With this procedure, we obtained loading values between 0,540 and 0,909 ($0,909 > \lambda > 0,540$) and for individual reliability equal to or below 0,25 ($R^2 \leq 0,25$). To analyse convergent validity, Average Variance Extracted (AVE) was calculated for each construct (see Table 5). According to the results obtained, all AVE values are found to be equal to or above 0,5 ($AVE \geq 0,5$) and therefore convergent validity is confirmed.

Table 5: Standardized regression weights and average variances extracted

Latent Variables	Manifest variables	Loadings	AVE	CR
Extroversion (EX)	EX1	0,765	0,514	0,855
	EX2	0,899		
	EX3	0,775		
Conscientiousness (CS)	CS1	0,730	0,664	0,758
	CS2	0,621		
	CS3	0,790		
Openness (OP)	OP1	0,542	0,506	0,746
	OP2	0,894		
	OP3	0,652		
Perceived Usefulness (UF)	UF1	0,763	0,719	0,938
	UF2	0,759		
	UF3	0,916		
	UF4	0,931		
	UF5	0,876		
	UF6	0,827		
Perceived Ease of Use (EU)	EU1	0,847	0,782	0,914
	EU2	0,909		
	EU3	0,896		
Use (FQ)	FQ1	0,898	0,527	0,811
	FQ2	0,783		
	FQ3	0,631		
	FQ4	0,540		
Quality (QL)	QL1	0,897	0,664	0,946
	QL2	0,857		
	QL3	0,880		
	QL4	0,833		
	QL5	0,860		
	QL6	0,898		
	QL7	0,592		
	QL8	0,685		
	QL9	0,781		
Decision Support (DS)	DS1	0,817	0,650	0,901
	DS2	0,788		
	DS3	0,879		
	DS4	0,898		
	DS5	0,622		
Performance (PF)	PF1	0,904	0,656	0,954
	PF2	0,873		
	PF3	0,833		
	PF4	0,826		
	PF5	0,805		
	PF6	0,828		
	PF7	0,859		
	PF8	0,852		
	PF9	0,656		
	PF10	0,697		
	PF11	0,744		

The measurement model presents absolute adjustment indices, in relation to parsimony, which are acceptable or even good (see Table 6). Only the GFI absolute adjustment measurement is slightly under 0,90.

Table 6: CFA model adjustment measures

Fit measures	Values	Level of acceptance (Hair et al., 2010)	Level of acceptance (Hair et al., 2010)
Absolute measures			
CMIN/DF	1,804*	Under 5 (acceptable)	Under 2 (good)
GFI	0,855	Above 0,9 (good)	Above 0,95 (very good)
RMSEA	0,049	Under 0,05 (very good)	Under 0,08 (good) , under 0,1 (poor)
Relative measures			
CFI (Comparative fit index)	0,901	Above 0.9 (good)	Above 0,95 (very good)
Parsimony measures			
PCFI (Parsimony Comparative Fit Index)	0,761	Above 0,6 (reasonable)	Above 0,8 (good)
PGFI (Parsimony Goodness of Fit Index)	0,740	Above 0,6 (reasonable)	Above 0,8 (good)

*CMIN = (1760,260), (p= 0,000) and DF= 976

4.3 Validation of the proposed model

According to Hair et al.(2010), the second stage of the SEM process consists of validating the structural model, thereby determining the veracity of the research hypotheses proposed. In this way, we can determine the adjustment of the structural model (see Figure1). The Absolute measures CMIN/DF present good adjustment (CMIN/DF=1,188) and the RMSEA value presents a very good adjustment index (RMSEA=0,024), considerably below 0,05. Only the GFI value is found to be slightly under 0,9. The Relative measure CFI presents very good adjustment (CFI=0,963), above 0,95. The Parsimony measure PCFI was revealed to have good adjustment (PCFI=0,88), above 0,8, and the PGFI measure was acceptable (PGFI=0,769)(Hair et al., 2010).

According to the research hypotheses formulated, the structural model proposed reflects the logical link between the constructs studied and visualization of the hypotheses (Yin, 1989).

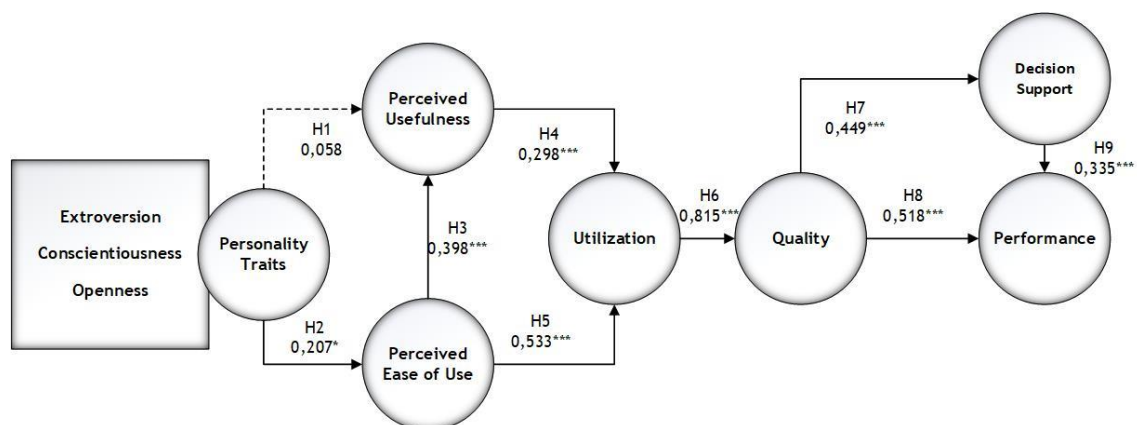


Figure 1: Structural model with standardized coefficient

Note: ***p<0,001, **p<0,01 and *p<0,05

-----> Represents the null or negative relationship hypothesized in H1

The results of SEM show no statistically significant relationship between personality traits and the usefulness of web portals ($\beta=0,058$ e $p=0,317$). Therefore, research hypothesis H1, according to which personality traits have a positive influence on perception of the usefulness of institutional web portals was not confirmed. However, personality traits were shown to have a positive and statistically significant effect on the ease of use of institutional web portals ($\beta=0,207$ and $p=0,002$), and so research hypothesis H2 is accepted, as personality traits have a positive influence on the perception of the ease of using institutional web portals.

TAM, extensively used in various contexts, and in acceptance of IT, considers that acceptance of IT depends on users' perception of its usefulness and ease of use (Davis et al., 1989). The results reveal a positive and statistically significant relationship between ease of use and the usefulness of web portals ($\beta=0,398$ e $p<0,001$). Similarly, there is a positive and statistically significant relationship between the usefulness of web portals and their use ($\beta=0,298$ and $p<0,001$). Therefore, research hypothesis H3, according to which perception of ease of use has a positive influence on perception of the usefulness of institutional web portals, and H4, according to which the usefulness of web portals influences their use positively, are both accepted. The ease of using web portals is also statistically significant and positive in explaining their use ($\beta=0,533$ and $p<0,001$). Therefore, hypothesis H5 is accepted.

The use of web portals can lead to improved quality of the information in university information systems (Ravichandran & Lertwongsatien, 2005). Therefore, research hypothesis H6 is accepted, since according to the results obtained, there is a positive and statistically significant relationship between the use of web portals and the quality of universities' information systems ($\beta=0,815$ and $p<0,001$).

The decision support provided by universities' information systems can lead these institutions' administration to make more grounded and correct decisions, thereby improving their performance (Kashani & Baharmast, 2017). The results reveal positive, statistically significant relationships between the quality of information in ISs and decision support ($\beta=0,449$ and $p<0,001$). Therefore, research hypothesis H7 is accepted. Furthermore, the results also show a positive, statistically significant relationship between the quality of information systems and university performance ($\beta=0,518$ and $p<0,001$), and finally, between decision support and university performance ($\beta=0,335$ and $p<0,001$). Therefore, research hypotheses H8 and H9 are accepted. Summarizing, except for hypothesis H1, according to which personality traits have a positive influence on perception of the usefulness of institutional web portals, the other 8 hypotheses presented were corroborated.

5. Discussion of the Results

Acceptance of technology has been reported as important for the effectiveness and efficiency of ISs (Chen, 2015). To understand technology acceptance, it is important to understand also users' profiles. In this context, the Big Five model has been extensively used in an attempt to understand what personality traits are associated with acceptance or rejection of IT (Easley & Crant, 2008; Rosen & Kluemper, 2008; Svendsen, Johnsen, & Almås-sørensen, 2013; Altanopoulou & Tselios, 2017). The results of this study do not agree with the literature on the influence of personality traits presented by the Big Five Model on users' perceived usefulness (TAM) (e.g. Devaraj, Easley, & Michael Crant, 2008; Svendsen et al., 2011; Özbek et al., 2014), as research hypothesis H1 was not corroborated, according to which personality traits have a positive influence on perception of the usefulness of institutional web portals.

Similarly, according to Özbek et al. (2014), the personality traits of extroversion, conscientiousness and openness were not significant in users' perception of the usefulness of Smart Phones. So possibly, the forecast of human behaviour may not be generalized and applied in all contexts (Pinho & Franco, 2017).

The Big Five Model has also been described as potentiating perception of the ease of using IT (Rosen & Kluemper, 2008; Svendsen et al., 2013; Altanopoulou & Tselios, 2017). The results obtained in this research agree with the literature, as they reveal a positive relationship between personality traits and web portal use in the academic context.

According to TAM, IT use, in general, is also influenced by users' perception of the ease of use and its usefulness (Chomchalao & Naenna, 2013). In the academic context, there is also a positive relationship between ease of use and the usefulness perceived by users in using systems, IT or platforms (Masrom, 2007; Teo, 2009; Teo et al., 2009; Teo, 2011). Similarly, this research revealed that perception of the ease of use and usefulness of web portals has a positive influence on their use by teaching and non-teaching staff in Portuguese universities.

University web portals, which generally contain information about the institution itself and its stakeholders, function as an interface for entry to diverse information systems (Reis, Barroso & Gonçalves, 2013; Reis et al., 2017). For example, the case of e-learning platforms or online libraries, which can be accessed from the institutional web portal (Harrington & Libby, 2017). Use of this interface for various information systems can provide updated user data, and thereby provide more complete, robust information systems of better quality (Al-Debei et al., 2013). From the information obtained from the web portal, universities can access crucial information for correct decision-making, and if necessary amend incorrect behaviour and decisions. Moreover, the information available on the web portal gives a wide-ranging view of resource distribution (Ling et al., 2014).

Therefore, obtaining up-to-date, relevant and reliable information allows institutions to gain competitive advantages over their competitors, alter their strategy and improve

organisational performance (AlRababah, 2017). Similarly, the results of this research reveal a positive relationship between web portal use and the performance of the universities studied.

6. Conclusions, Limitations and Suggestions

6.1 Conclusions and implications

The main objective of this research was to clarify the importance of web portals and ISs, both in supporting institutions' management and for university performance, considering the effect of individuals' acceptance of technology, through the TAM and the Big Five Model. Regarding theory, this study contributes to the existing literature on the factors influencing web portal use and to the importance of the quality of information in ISs and decision support for university performance. Contrary to expectations, the results revealed that the personality traits of extroversion, conscientiousness and openness are not relevant for teaching and non-teaching staff's perception of the usefulness of Portuguese universities' web portals. This situation may be due to human behaviour not always being predictable (Pinho & Franco, 2017). However, personality traits do influence teaching and non-teaching staff's perception of the ease of using web portals. In turn, the ease of using web portals influences the usefulness of this tool positively, and these two factors influence their use positively. These results reinforce the literature on TAM and the Big Five Model and on IT and web portals in particular, which has been little explored in the academic context.

The results also emphasize the importance of quality of information in university ISs. Up-to-date and relevant information, serving university purposes completely, can potentially contribute to the decision support process and to university performance. Standing out as a contribution to practice is the importance of all university departments or services constructing ISs jointly. In this way, ISs that serve HEIs' individual and collective needs can be achieved. According to Trieu (2017), efficient, effective information systems are of great value to institutions, and can lead to them obtaining competitive advantages and improved performance. This situation may arise from university administrations having the information that allows them to make correct and timely decisions. In this connection, the information from ISs simultaneously allows keeping administration informed about important matters for university management and has the potential to improve institutional performance. Summarizing, the implementation of efficient, effective ISs is an important factor for the success of Portuguese universities.

6.2 Limitations and suggestions for future investigation

Although research hypothesis H1, that personality traits have a positive influence on perception of the usefulness of institutional web portals, was not corroborated, it presents a

good theoretical basis (e.g. Easley & Crant, 2008; Rosen & Kluemper, 2008; Svendsen, Johnsen & Almås-sørensen, 2013; Altanopoulou & Tselios, 2017). For better understanding of this situation, the structural model presented in this research should be applied in different cultural, social and geographical contexts. This would make it possible to carry out a comparative study of different situations and determine the influence of these contexts on the use of web portals. Consequently, future research could consider different geographical contexts, besides the Portuguese one, and other cultural and social situations.

Although the sample was sufficient to carry out the intended study, it could have been more representative of the population. A suggestion for future lines of research is for studies to incorporate a broader, international sample.

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CHAPTER 4

Application of Innovation Diffusion Theory to the E-learning Process: Higher Education Context

Abstract

This study aims to identify the factors influencing the use of e-learning platforms in the academic context. To fulfil this objective, a quantitative study was carried out through a questionnaire directed to Portuguese university students, which obtained a total of 631 valid answers. The results obtained, based on structural equation modelling, show that the characteristics of e-learning platforms, proposed by Innovation Diffusion Theory and Personal Innovativeness in Information Technology influence the use of this tool positively. This research contributes to advancing the literature on this subject, and for practice the importance of elaborating student-centred e-learning platforms is highlighted. These and other implications and suggestions for future research are also presented.

Keywords: E-learning, Higher Education, Personal Innovativeness in Information Technology (PIIT), Innovation Diffusion Theory (IDT)

1. Introduction

With growing globalization, Information Technology (IT) tends to occupy a prominent place in modern societies (Oye et al., 2012). These tools have come to change how individuals live, work, communicate and learn (Khan, 2005). Continuously developing IT provides a varied range of services online both to firms and universities, namely in the process of electronic learning (e-learning)(Wu et al., 2010). The term e-learning means distance, flexibility or virtual learning (Khan, 2005), and according to Sridharan et al. (2010), e-learning refers to the application of IT so as to improve the teaching and learning process. In general, the literature considers that e-learning, as a learning process, incorporates the use of the Internet or Intranet to access pedagogical material or in lecturer and student interaction (Wu et al., 2010).

Unlike traditional teaching, e-learning platforms have allowed increased flexibility, eliminated geographical barriers and improved the effectiveness of individual and collaborative learning (Santhanam et al., 2008). However, the literature also presents some disadvantages of this type of teaching, namely, the lack of social interaction, isolation, major financial investment to implement and maintain the platforms supporting e-learning (Wu et al., 2008; Wu et al., 2010). In order to benefit from the best of both types of teaching, some universities have chosen systems which combine simultaneously environments and techniques of traditional and online teaching (Tick, 2006; Oye et al., 2012).

From the student perspective, e-learning platforms and the internet (World Wide Web) have facilitated access to knowledge, and also improved the effectiveness of the learning process (Tan, 2013). These Information Systems (IS) can make learning more efficient and lead to an improved learning environment, thereby improving students' attitude towards the learning process and the use of e-learning platforms (Wu and Hwang, 2010).

Nevertheless, according to Sridharan et al. (2010), there is a shortage of empirical research into the effectiveness of these platforms from the student perspective. In addition, the literature also reveals individuals are somewhat reluctant to accept and subsequently use this technology (Rym et al., 2013; Abdullah and Ward, 2016).

In this context, an individual's personality traits have been described as possible potentiators of IT acceptance and use, and as a way to predict these agents' behaviour in this process (e.g., Barrick et al., 2001; Barnett et al., 2015; Xu et al., 2016). Personal Innovativeness in Information Technology (PIIT) or individuals' natural aptitude to accept and use new IT can stimulate the use of those tools. Nevertheless, this personality trait has been little studied in the literature (Lu et al., 2005).

On the other hand, for decades, research on Innovation Diffusion Theory (IDT) has recognised that innovative individuals are more willing to accept new ideas and are able to cope with

high levels of uncertainty (Rogers, 1962; 1995; 2003). Although the literature on this subject presents various studies about the influence of personality traits on the stimulus for internal motivation (e.g. Agarwal and Prasad, 1998; Lee et al., 2007; Özbek et al., 2014), a limited number of those studies include personality traits in acceptance of technology and even fewer in the intention to use innovations in IT/IS (Lu et al., 2005).

Universities have changed the teaching/learning concept from the traditional form to that of e-learning (Tan, 2013). For this type of teaching to be successful, the agents involved in this process must accept and use e-learning platforms (Hassanzadeh et al., 2012). Despite the proliferation of e-learning platforms in the academic sphere and the attempt to identify the factors contributing to their success (Shee and Wang, 2008; Kim et al., 2012), a limited number of studies include the IT characteristics proposed by IDT (Aizstrautaa et al., 2015).

Given these gaps, this research aims to determine whether PIIT and the characteristics of e-learning platforms influence the use of those platforms by students in the academic field, and thereby contribute to increasing knowledge about this subject.

The study is organised in 4 sections or chapters. The second section presents a review of the literature on factors contributing to acceptance and adoption of IT in general, and e-learning platforms, together with the research hypotheses developed. The third section describes the methodology used. Section 4 presents and discusses the results in the light of the theoretical framework of the subject studied. Section 5 highlights the contributions of this research to theory and practice, together with the limitations and future lines of research in this field.

2. Literature Review and Research Hypotheses

2.1 Influence of the characteristics of e-learning platforms on their use

Distance learning originated at the beginning of the 20th century in the United States of America, at the University of Chicago, in an attempt for lecturers and students in different places to correspond with each other. The development of radio communications due to the Second World War facilitated communication between individuals (Preece et al., 2003). In the 1950s, the appearance of television allowed visual contact between lecturers and students from different geographical areas. Later, in the 1970s and 80s, the emergence of personal computers and electronic mail gave a great boost to distance learning. However, it was the advent of the World Wide Web (WWW) in 1991 that allowed the implementation of web-sites and e-learning platforms (Sun and Chen, 2016). Most universities adopt ready-to-use e-learning platforms (eg. Moodle, Edmodo, etc.) to produce and share knowledge, while others choose to develop their own applications. These tools support activities and the evolution of the learning process (Utomo et al., 2017). The literature is rich regarding the

dimensions or factors contributing to the effectiveness of e-learning platforms (e.g. Santhanam et al., 2008; Wu and Hwang, 2010; Rym et al., 2013).

The IDT developed by Rogers (1962) explains the process by which some individuals adopt new behaviour or acquire new products/services when they first go on sale, whereas others may possibly never acquire them. According to Rogers (1962; 1995; 2003), diffusion refers to the process whereby innovation is communicated through certain channels over time among members of a social system. For Zabadi (2016), IDT is an extension of the Technology Acceptance Model (TAM) which incorporates users' experience as a factor influencing perception of the ease of use and usefulness of technology. The use of e-learning platforms refers to the frequency with which these tools are accessed and used (Al-Debei et al., 2013). According to IDT, the spread of innovations depends on the following characteristics: (1) relative advantage, (2) compatibility, (3) complexity, (4) observability and (5) trialability. If innovations or new IT have characteristics distinguishing them from others, are compatible with users' values, are user-friendly, are observed in institutions and can be tried out by users, they will be more easily accepted and used (Rogers, 1962; 1995; 2003).

Relative advantage refers to the extent to which adoption/use of innovative IT is understood as an improvement on the previous version (Karahanna et al., 1999). In the same line, Davis (1989) considers in the TAM, the perception of usefulness offered by IT. These two points of view have the same meaning (Moore and Benbasat, 1991) and represent individuals' belief that use of given IT could improve their performance (Venkatesh and Davis, 2000).

In the academic context, the usefulness of systems or IT has been identified as a factor with great influence on students' choices and behaviours (Ozkan and Koseler, 2009; Utomo et al., 2017). Here, various studies have attempted to determine students' perception of the effectiveness of e-learning platforms (Webster and Hackley, 1997; Volery and Lord, 2000; Selim, 2007). According to Shee and Wang (2008) and Lee et al. (2009), platforms' design is a determinant factor of students' satisfaction and the success of these tools. In addition, perception of the usefulness of e-learning platforms is positively related to use of these tools (Pituch and Lee, 2006; Liaw et al., 2007). Use of computerized systems is related to users' behaviour and refers to the effective use of systems or their output (Hassanzadeh et al., 2012). Use of these tools measures the way and extent to which an information system's capability is being used. At the individual level, system use is defined by an individual's use of one or more resources of a system to perform tasks (Al-Debei et al., 2013). However, the literature is not consensual as to the influence of users' perceived usefulness on adopting these platforms. According to Yuen and Ma (2008), students' perceived usefulness of e-learning platforms did not have a significant effect on the intention to use this tool.

Compatibility refers to the extent to which adoption of innovation in IT is congruent with what individuals do (Karahanna et al., 1999). According to the IDT presented by Rogers (1962; 1995; 2003), innovations should be consistent with users' beliefs, values, past

experiences and needs. In the university context, it is necessary to understand the drivers leading to students' use of these platforms, in order to devise effective e-learning environments (Konradt and Sulz, 2001). The success of these platforms depends largely on implementing educational models that meet students' needs (Lee et al., 2009).

Complexity concerns the degree to which the use of any system requires effort by the user (Karahanna et al., 1999). The TAM addresses the concept of IT's user-friendliness and which, according to Moore and Benbasat (1991), is similar to that of the complexity of innovations suggested by IDT. For Rogers (1962; 1995; 2003), easily understood and used innovations spread more quickly. Therefore, the complexity of a system has a negative impact on its use (Shih and Huang, 2009). Similarly, Teo (2008) considers that the less complex a system is, the greater the likelihood of being adopted and used.

In the academic context, despite e-learning having the potential to improve performance in education, this tool will not be useful if students do not accept it and use it in the learning process (Lee et al., 2009). In this scenario, TAM has been approached as a way to predict students' behaviour in the e-learning context regarding the ease of using these platforms (Selim, 2003; Selim, 2007). Results suggest that the complexity or ease of using these platforms by students may be an important factor in their use (Pituch and Lee, 2006; Yuen and Ma, 2008; Lee et al., 2009).

Observability is a characteristic linked to the degree to which innovations are visible in organisations (Karahanna et al., 1999). A high degree of observability indicates that individuals may not only have the opportunity to observe an innovation being used, but also to communicate the information to others (Dupagne and Driscoll, 2009). An individual's continuous exposure to an object can make that agent's attitude towards it more positive (Zajonc and Markus, 1982). According to Yang (2007), systems or IT that can be observed or described by users tend to be perceived as useful and easy to use. In the academic domain, Lee et al. (2011) suggest there is a positive effect between the observability of e-learning platforms and their use.

Then again, **trialability** means the degree to which one can experiment with an innovation on a limited basis before making an adoption or decision (Karahanna et al., 1999), i.e., the trialability of innovations refers to this being done by stages (Lee et al., 2011). Although scarce on this issue, the literature suggests a positive effect of trialability on the use of systems or IT (Lee, 2007). According to Yang (2007), a high degree of trialability also leads to a high degree of usefulness, ease and use of systems. From the arguments presented, the following research hypothesis is proposed.

H1. The characteristics of e-learning platforms influence their use positively.

2.2 Influence of personality traits on the use of e-learning platforms

The TAM model, which has been widely debated in the literature (e.g. Karahanna et al., 1999; Bahry et al., 2007; Abdullah and Ward, 2016) considers that the user-friendliness and usefulness of technology or systems are determinant for their use (Davis, 1989). However, these factors explain only 40% of their use. So for better understanding of the acceptance of IT, Lu et al. (2005) consider that external factors (e.g. personality traits) should be more explored in the literature.

According to Lo (2014), a personality trait is defined as an individual characteristic that exerts a generalized influence on a wide range of behaviour relevant to that characteristic. Consequently, personality traits can be used as a way to predict and explain an individual's behaviour (Devaraj et al., 2008). The explanation of that person's behaviour will be found in themselves, rather than in the situation, therefore suggesting some kind of internal process or mechanism that can lead to a certain type of behaviour (Kovaleva et al., 2013; Khalid et al., 2013; Özbek et al., 2014).

In the sphere of IT, Personal Innovativeness (PI) is a personality trait that may explain how individuals respond to innovations (Jeong et al., 2009). In this context, Agarwal and Prasad (1998) present the PIIT construct and explain its influence on adoption of IT. These authors define PIIT as the individual tendency or aptitude to try out new IT.

However, PI has been neglected in the literature as potentially influencing the adoption of IT. Agarwal and Prasad (1998) studied the role of Personal Innovativeness in Information Technology (PIIT) as a moderator between individual perception of new IT and its antecedents. Although PIIT has been used in recent literature as a way to explain individuals' acceptance of technology, according to Nov and Ye (2008) the personality traits underlying that behaviour have been neglected.

For Rogers (1962; 1995; 2003), individuals' profile determines the spread of innovation and people can be classified and grouped according to their attitude towards the adoption of technology. Individuals with a high degree of PIIT tend to develop a more positive attitude towards new IT and tend to use it more quickly (Agarwal and Prasad, 1998; Jeong et al., 2009), meaning that highly innovative individuals are more willing to adopt new IT in their daily routine and cope well with the uncertainties arising from its use (Lee et al., 2007).

It is extremely important for organisations to understand PI (Nov and Ye, 2008). This allows identification of individuals who tend to be early adopters of new IT and in this way serve as facilitating agents of change in its spread (Agarwal and Prasad, 1998). Individuals with a high degree of PIIT are more open to risk (Agarwal and Karahanna, 2000; Jeong et al., 2009).

PIIT affects users' acceptance of new technology (Agarwal and Prasad, 1998; Noh et al., 2014). Individuals with a high level of PI will be eager to repeat a behaviour if they have

recognised the benefits of the IT used. Therefore, these agents are likely to benefit more from new IT (Lin and Filieri, 2015). For example, Aharony (2013) concludes that individuals with a high degree of PIIT and extroversion tend to use Facebook better. Similarly, Karim et al. (2009) consider there is a relationship between a high degree of extroversion and students' PIIT and well-intentioned use of the Internet.

PIIT reflects individuals' willingness to change (Agarwal and Prasad, 1998). Previous research indicates that highly innovative individuals tend to look for new experiences and have leanings towards innovative products based on new IT (Karahanna et al., 2002; Oreg, 2003). Similarly, Nov and Ye (2008) found a positive relationship between PIIT and individuals' openness. Considering the literature review above, the second research hypothesis is presented.

H2. PIIT has a positive influence on the use of e-learning platforms.

3. Methodology

3.1 Sample

In order to identify the factors influencing the use of e-learning platforms, the universe of this research, of a quantitative nature, was defined as Portuguese university students. A sample of convenience was selected due to factors of a geographical order. Universities in the north (University of Trás-os-Montes e Alto Douro), centre (University of Aveiro and University of Beira Interior) and south (University of the Algarve) of mainland Portugal were selected. Using this criterion, a greater diversity of responses was obtained and an acceptable sample of the population studied (Banerjee and Chaudhury, 2010).

The respondents correspond to 430 female students and 201 males and the average age is 24,4 years. A considerably varied range was observed regarding students' academic level (see Table 1). Generally, holders of a first degree collaborated most, corresponding to 42% of the total answers.

Table 1: Characterisation of students

Gender	Frequency	Percentage
Female	430	68,1
Male	201	31,9
Total	631	100,0
Academic qualifications		
Secondary Education	20	31,9
Diploma	12	1,9
Degree	265	42,0
Master	120	19,0
Ph.D.	29	4,6
Other	4	0,6
Total	631	100,0

3.2 Data collection and measurement of variables

The data-collecting technique was a structured questionnaire, divided in three sub-groups of questions. The first refers to the characteristics of the e-learning platform, the second to PIIT, and the third assesses the frequency of using these platforms.

According to the IDT presented by Rogers (1962), innovations should have various characteristics (relative advantage, compatibility, complexity, observability and trialability) in order to be easily disseminated. Therefore, they form the construct of e-learning platform characteristics (see Table 2). To test the influence of the relative advantage and complexity of using e-learning platforms, the research by Lee et al. (2009) and Karahanna et al. (1999) was used to measure the variables of compatibility, observability and trialability. The scales used were adapted so that they could be applied to the academic context. The variables were measured on a Likert-type scale from 1- completely disagree, to 7- completely agree, with respondents having to indicate their degree of agreement with the statements presented.

Concerning measurement of PIIT, the scale presented by van Raaij and Schepers (2008) was used to measure the personal aptitude to adopt IT. The items were adapted and measured on a Likert-type scale from 1- completely disagree, to 7- completely agree.

Measurement of the construct of e-learning platform use was based on the scale developed by Al-Debei et al. (2013), with the frequency of using this tool being measured on a scale from 1- never, to 7- always. The scales used underwent minor adjustments in order to be applied to the academic context and IT.

Table 2: Measurement of constructs

Constructs	Variables	Items	Scale	Authors
Characteristics of E-learning Platforms	Relative Advantage (RA)	RA1. Improves the results of my learning RA2. Is very useful to me RA3. Helps me to learn effectively	1- Completely disagree, to 7- Completely agree	Lee et al. (2009)
	Compatibility (CP)	CP1. In order for me to adopt e-learning platforms, these would have to be compatible with most of my learning aspects CP2. In order for me to adopt e-learning platforms, these would have to meet my learning style CP3. In order for me to adopt e-learning platforms, these would have to meet my way of learning	1- Completely disagree, to 7- Completely agree	Karahanna et al. (1999)
	Complexity (CX)	CX1. The methods of study are easy to understand CX2. Platform is easy to use	1- Completely disagree, to 7- Completely agree	Lee et al. (2009)
	Observability (OB)	OB1. At my university we see students using the e-learning platform on many of the institution's computers OB2. At my university, I saw many students using the e-learning platform on personal computers	1- Completely disagree, to 7- Completely agree	Karahanna et al. (1999)
	Trialability (TR)	TR1. Before deciding to adopt or not an e-learning platform, I could use them for testing TR2. Before deciding to adopt or not an e-learning platform, I would be able to adequately test it TR3. I would be authorized to extensively use e-learning platforms for testing over an extended period of time, fully exploring their features	1- Completely disagree, to 7- Completely agree	Karahanna et al. (1999)
Personality Traits	PIIT	PIIT1. If I hear something about a new IT, I look for a way to experience it PIIT2. Within my peer group, I am usually the first to explore new ITs PIIT3. I like to try new ITs PIIT4. Overall, I hesitate to try out new ITs	1- Completely disagree, to 7- Completely agree	van Raaij & Schepers (2008)
Use of e-learning Platforms (ULP)		ULP1. I access digital content ULP2. I attend classes ULP3. I communicate with colleagues ULP4. I participate in forums	1- Never, to 7- Always	Al-Debei et al. (2013)

With the questionnaire completed, a pre-test was carried out on 8 January 2018 with students from different course, aiming to identify failings, problems with interpretation or possible

improvements to be introduced. The suggestions indicated by the students were considered and introduced to the questionnaire. This data-collecting instrument was divided in three sub-groups of questions. The first sub-group deals with the characteristics of e-learning platforms proposed by the IDT, the second sub-group of questions refers to the PIIT and the third refers to the use of e-learning platforms.

On 21 January 2018, the questionnaires were sent by e-mail to students at the universities selected. In a second phase, the questionnaires were applied face-to-face, given the low rate of response obtained initially (10%) (students from the selected universities were identified randomly to answer the questions on the questionnaire). After applying the data-collecting instrument by e-mail and face-to-face, a total of 631 valid answers were obtained. The institution collaborating most in this research was the University of Beira Interior (see Table 3), with approximately half the answers received (49,1%), whereas the University of Trás-os-Montes e Alto Douro provided only 6,3% of responses.

Table 3: Total answers by university

University	Frequency	Percentage
University of Trás-os-Montes e Alto Douro	40	6,3
University of Aveiro	188	29,8
University of Beira Interior	310	49,1
University of the Algarve	93	14,7
Total	631	100,0

The consistency of each dimension was measured through the Cronbach Alpha and Composite Reliability. The Cronbach Alphas varied between 0,790 and 0,923, values above what is acceptable (0,70)(Hair, Black, Babin, Anderson and Tatham, 2010), thereby showing suitable levels of internal consistency (see Table 3). The Composite Reliability (CR) values indicate good internal consistency for levels above 0,70 (Hair et al., 2010). Analysis of Table 4 shows all the CRs to be suitable, as the lowest value is found in the observability variable (CR= 0,82), and the highest in the variable of relative advantage (CR= 0,92). Table 3 also presents the mean, standard deviation and correlations between variables. The highest mean is found in the observability variable (mean = 5,121), and the lowest in the construct of e-learning platform use (mean = 5,180). The standard deviations indicate the greatest dispersion of answers in the construct of e-learning platform use (SD= 1,725) and the least in the complexity variable (SD= 1,199). Analysis of Table 4 reveals that the most correlated dimensions are relative advantage and observability (0,593), with least correlation being found between compatibility and e-learning platform use (0,194). However, all the dimensions are correlated at a 1% level of significance.

Table 4: Average, Standard deviation, Cronbach Alpha and Pearson correlations between dimensions

Dimensions	Average	Standard deviation	Cronbach Alpha	1	2	3	4	5	6	7
1. Relative advantage (RA)	5,069	1,263	0,923	1						
2.Compatibility (CP)	4,959	1,292	0,914	0,361**	1					
3.Complexity (CX)	4,986	1,199	0,834	0,745**	0,391**	1				
4.Observability (OB)	5,121	1,418	0,821	0,593**	0,320**	0,563**	1			
5.Trialability (TR)	4,499	1,444	0,880	0,477**	0,479**	0,486**	0,335**	1		
6.PIIT	4,518	1,314	0,868	0,496**	0,284**	0,483**	0,318**	0,492**	1	
7.Use of e-learning platform (ULP)	4,180	1,725	0,790	0,320**	0,194**	0,339**	0,208**	0,358**	0,418**	1

N = 631

**Correlation is significant at the 0.01 level

3.3 Data analysis

After obtaining the data, these were treated with SPSS vs 24 and Amos vs 24 software. The hypotheses were tested using structural equation modelling (SEM). SEM is a multivariate statistical technique allowing simultaneous assessment of relationships between various constructs and testing a causal order between the variables (Kaplan, 2000; Aizstrautaa et al., 2015), facilitating the discovery and confirmation of relations between diverse variables. The most important characteristic of SEM is the capability to check relationships between the various latent constructs, which can be examined in order to reduce the error in the model (Hair et al., 2010). This characteristic allows assessment and elimination of variables with weak measurement, thereby bringing the structural model closer to the situation studied (Chin et al., 2008; Hair et al., 2014).

4. Results

4.1 Assumptions of analysis with structural equations (SEM)

According to Hair et al. (2010), violation of the assumptions of normality and linearity can cast doubt on the credibility of the results obtained. The assumption of normality was tested using measures of asymmetry (Sk) and kurtosis (Ku). The results revealed that the $|Sk|$ values vary between 0,841 and 0,135 and the $|Ku|$ values between 1,225 and 0,006, suggesting non-violation of the assumption of normality. Linearity was analysed using the Pearson correlation coefficients (see Table 3), recording significant linear relationships between all the variables and confirming the assumption of linearity.

The variance inflation factor (VIF) and tolerance values (T) can identify the existence of multi-collinearity. According to Hair et al. (2010), values of $T > 0,1$ and $VIF < 10$ indicate a low level of multi-collinearity. All the indicators calculated in this study revealed the non-existence of multi-collinearity, $T > 0,361$ and $VIF < 2,664$.

4.2 Validation of the measurement model

The measurement model was validated using Confirmatory Factor Analysis (CFA), which indicates the model's degree of adjustment to the data. This process aims to eliminate errors of high measurement, less than or equal to 0,25 and low factor loadings, under 0,5 (Hair et al., 2010). After carrying out this procedure/adjustment and eliminating items in those situations, Table 5 shows that the loadings are relatively high, above 0,665 and that the variance measured by the Average Variance Extracted (AVE) is above 0,641, therefore acceptable indicators, according to Hair et al. (2010).

Table 5: Loadings and extracted variances

Latent variables	Manifest variables	Loadings	AVE	CR
Relative Advantage (RA)	RA1	0,875	0,801	0,92
	RA2	0,891		
	RA3	0,794		
Compatibility (CP)	CP1	0,802	0,787	0,91
	CP2	0,951		
	CP3	0,902		
Complexity (CX)	CX1	0,841	0,719	0,840
	CX2	0,855		
Observability (OB)	OB1	0,806	0,698	0,82
	OB2	0,865		
Triability (TR)	TR1	0,841	0,717	0,88
	TR2	0,903		
	TR3	0,794		
PIIT	PIIT1	0,874	0,647	0,88
	PIIT2	0,752		
	PIIT3	0,904		
	PIIT4	0,665		
Use of e-learning platforms (ULP)	UTLP2	0,796	0,641	0,84
	ULP3	0,903		
	ULP4	0,69		

After concluding the process of validating the measurement model, the next step was to analyse individual reliability (R^2), finding that ($R^2 \geq 0,25$). Analysis of Table 4 also reveals that the loadings ($\lambda > 0,5$) fall within the acceptable levels indicated by Hair et al.(2010).

According to Table 6, the measurement model presents suitable adjustment (CMIN/DF=2,984, GFI=0,932 and RMSAE=0,56). Similarly, the CFI=0,966 and the measures of parsimony (PGFI=0,661 and PCFI=0,758) are within the acceptable levels according to Hair et al. (2010). Consequently, the measurement model was considered acceptable.

Table 6: Model's adjustment measures

Adjustment measures	Values	Level of acceptance (Hair et al., 2010)
Absolute measures		
CMIN/DF	2,984	<2 (good) 5 (acceptable)
GFI	0,932	>0,9 (good) 0,95 (very good)
RMSAE	0,56	<0,05 (very good) 0,08 (good) 0,1 (poor)
Relative measures		
CFI	0,966	>0,9 (good) 0,95 (very good)
Parsimony measures		
PGFI	0,661	>0,6 (reasonable) 0,8 (good)
PCFI	0,758	>0,6 (reasonable) 0,8 (good)

4.3 Validation of the structural model and discussion of the results

After validating the measurement model, we turned to the structural model in order to reject or accept the research hypotheses suggested in the literature review. The absolute measures (CMIN/DF=1,939, GFI=0,902 and RMSEA=0,075) indicate suitable adjustment. Similarly, the relative measures (CFI=0,935) and parsimony measures (PGFI=0,696 and PCFI= 0,797) are also within acceptable limits (Hair et al., 2010). Therefore, the structural model presented in Figure 1 is accepted.

Figure 1 illustrates the relationship between the characteristics of e-learning platforms, PIIT and use of these e-learning platforms in the higher education context.

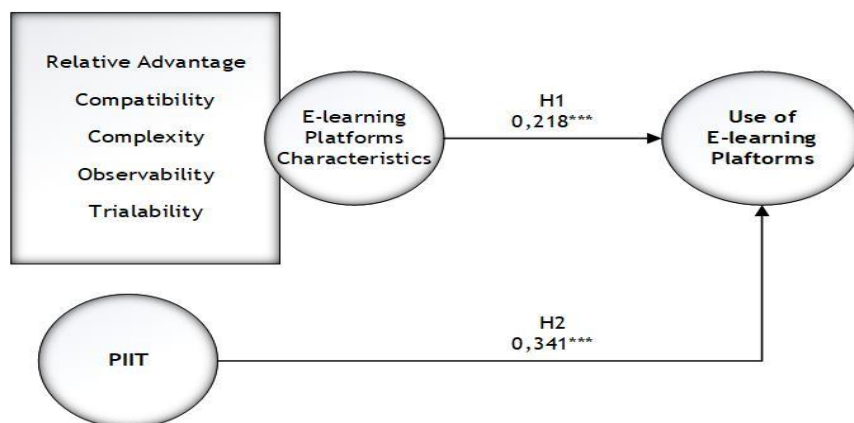


Figure 1: Structural model with standardized coefficients

Note: *p<0,05, **p<0,01 and ***p<0,001

The results indicate that the characteristics of e-learning platforms are statistically significant in the use of these platforms. Since ($\beta = 0,218$) and ($p < 0,001$), we can conclude that besides significant, the effect is positive. Therefore, research hypothesis H1 is accepted, according to which the characteristics of e-learning platforms influence their use positively.

The benefits of teaching/learning through e-learning mentioned in the literature are many, and mean the reduction of teaching and non-teaching staff and physical infrastructure, which in turn can lead to significant reduction in costs. In the current situation of reducing costs in education, the success of teaching/learning through e-learning is vital for universities (Tan, 2013). For students to accept and use the e-learning platforms provided by universities, these tools must offer them relative advantages. Use of this type of tool must bring benefits, which will mean an improved or easier learning process for students. This perception of the relative advantages to be obtained is also defended by the technology acceptance model TAM (Svendsen et al., 2011; Chang and Yang, 2013; Özbek et al., 2014; Chen, 2015).

The literature states that compatibility between IT and its users' values is determinant for acceptance and use (Rogers 1962; Karahanna et al., 1999; Rogers, 1995; Rogers, 2003). Similarly, in the academic context, e-learning platforms should agree with students' values. The complexity characteristic of IT has been defended in the literature, more specifically by TAM, as determinant for the acceptance of new IT (Svendsen et al., 2011; Chang and Yang, 2013; Özbek et al., 2014; Chen, 2015). The fact of users perceiving ease of use, or not needing to expend efforts in using the technology is also fundamental for IT adoption (Teo, 2008). In the academic context, the same situation is found. E-learning platforms should be easily to use by students. Therefore, these agents will accept and use e-learning platforms, according to the literature on this subject.

The observability of IT is referred to as positive in the use of new IT. If users have visual contact with IT, this makes them assimilate and consider its use as normal in performing their tasks (Yang, 2007; Lee, Hsieh and Hsu, 2011). The same situation occurs in this study with university students. Students' seeing other agents at the universities using e-learning platforms determines the acceptance and use of this tool. Observation of, and contact with e-learning platforms is seen to be a driver of the use of this IT in the academic context.

The last characteristic of IT, trialability, is stated by the literature to be an incentive to use. The possibility of testing IT, even before its implementation is considered definite, so that users can explore its potential, is a determinant of its acceptance (Karahanna et al., 1999; Lee, 2007; Yang, 2007; Lee et al., 2011). In the universities, students being able to analyse e-learning platforms before they came into service was found to be a driver of their subsequent acceptance and use.

Summarizing, the characteristics of IT set out by IDT were shown to be determinant for its acceptance and use (Rogers 1962; Rogers, 1995; Rogers, 2003). Similarly, this study revealed

that the characteristics of e-learning platforms have a positive influence on students' use of them. The empirical evidence obtained agrees with the literature on the subject.

The results also indicate the relationship between PIIT and the use of e-learning platforms. Since PIIT is statistically significant in the use of e-learning platforms, ($\beta = 0,341$) and ($p < 0,001$), we can conclude that the effect is positive. Therefore, research hypothesis H2 is accepted, according to which PIIT has a positive influence on the use of e-learning platforms.

Regarding the influence of PIIT, individuals with a high degree of Personal Innovativeness tend to accept and use new IT (Agarwal and Prasad, 1998; Jeong et al., 2009). These agents have a high degree of openness and an innate tendency to experiment, without fear of failing, as these people have great self-confidence (Lee et al., 2007). The results of this research revealed that students with a high degree of Personal Innovativeness are more likely to use e-learning platforms, as suggested by the literature in other contexts.

To summarize, the research hypotheses proposed in this research, namely H1 (The characteristics of e-learning platforms influence their use positively) and H2 (PIIT influences the use of e-learning platforms positively) were corroborated. This strengthens the theory on this subject, which suggests that PIIT and the characteristics of new IT contribute to acceptance and use of those tools. This study demonstrates that the characteristics of e-learning platforms, specifically, have a positive influence on students' use of them in the academic context.

5. Conclusions, Limitations and Future Lines of Research

With the development of internet-based technology, universities have invested large sums of money in implementing e-learning platforms, aiming to support and improve the teaching/learning process (Islam, 2013; Utomo et al., 2017). This tool can provide substantial improvement in the quality of teaching and focus on students' needs. Currently, e-learning platforms have become a practically essential tool in teaching (Alvarez et al., 2013). For e-learning platforms to be successful, students must accept and use these tools. This research aimed to analyse the influence of the characteristics of e-learning platforms and PIIT on use of these platforms in the academic context.

According to IDT, an innovation will be spread more easily if it has characteristics of relative advantage, compatibility, complexity, observability and trialability. The results of this study reinforce theory about the characteristics of innovations, in the particular context of universities and in relation to e-learning platforms.

The literature indicates that high levels of PIIT in individuals lead to greater acceptance and use of innovations. This study strengthens the theory on PIIT, through university students' use

of e-learning platforms. Therefore, based on IDT and setting out from a structural model, the results obtained revealed that the characteristics of e-learning platforms and students' PIIT stimulate the use of these platforms.

This research also contributes to practice, in that it emphasizes the need to develop student-centred e-learning platforms, in order to match their needs and characteristics. According to Pinho et al. (2018), the development of personalized User Interfaces (UIs) focused on the user is a factor in the success of institutional websites.

For students to derive greater benefit from these platforms, universities could provide curricular units and/or short courses devoted to developing students' soft skills and transversal competences. Based on students' degree of PIIT, universities can make a more conscious and correct investment in teaching. If students' PIIT is high, universities can concentrate their investment on e-learning, or otherwise invest more in the traditional type of teaching. Consequently, knowledge of students' PIIT can lead universities to improve the efficiency and effectiveness of internal processes.

This research presents some limitations. Although sufficient to carry out the intended study, the sample could have been more representative of the population, so suggested as a future line of research is to extend the sample to all Portuguese universities. The Portuguese higher education system is formed of state and private universities and polytechnic institutes. While state universities are funded exclusively by the state, private universities obtain a significant part of their funding through private financing. Polytechnic institutes can be state or private, but the essence of their teaching differs from that of universities. They have a more practical focus and courses directed to the labour market. Due to the considerable differences between these higher education institutions, another line of research could be to make a comparative study.

The inclusion of other personality traits, such as extroversion, openness and conscientiousness, presented by the Big-Five Model, which influence IT adoption (Barrick et al., 2001; Barnett et al., 2015) would provide greater knowledge about the influence of students' profile on the use of e-learning platforms. Consequently, the personality traits of extroversion, openness and conscientiousness can be included in future research.

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CHAPTER 5

Success Factors of E-Libraries in the Higher Education Context: A Case Study

Abstract

The main aim of this study is to identify and understand the factors of success in the implementation, use and maintenance of electronic libraries (e-libraries) in the academic context of higher education, based on Resource-Based View (RBV) and Social Learning Theory (SLT). To achieve this goal, a qualitative approach was adopted, through a case study of the e-library of the University of Beira Interior (UBI), Portugal. The data were obtained from direct observation, interviews with various actors (staff of the Library, Computing and Administration Services of this institution) involved in the process of implementing and maintaining the e-library, and also documentary analysis. The empirical evidence obtained reveals the most relevant factors for e-library success to be: (1) minimization of costs, (2) acceptance and use of e-libraries, and (3) staff training. This study shows the great importance of library staff training regarding use and exploitation of the e-library's functions. Thorough knowledge of the e-library means improved use and search effectiveness. The minimization of costs associated with its implementation and maintenance is also a factor determining its success. Given the limited number of empirical studies exploring the topic, this study is particularly important and innovative in the context of Higher Education Institutions (HEI). Based on the empirical evidence obtained, a framework is proposed, grouping and reflecting the most important factors for the success of e-libraries in the HEI context.

Keywords: Costs, E-library, Higher Education Institutions (HEI), Information Technology (IT), Resource-Based View (RBV), Social Learning Theory (SLT), Training, University of Beira Interior (UBI)

1.Introduction

Information Technology (IT) has the potential to trigger the socio-economic progress of developed societies. The existence of functional telecommunications infrastructure can allow improvements in the area of education, and easier access to knowledge can lead to substantial improvements in teaching (Park, Roman, Lee, & Chung, 2009; Turan & Bayram, 2013). Thanks to rapid technological development, Higher Education Institutions (HEI), by implementing IT and Information Systems (IS), have made efforts to provide their stakeholders with fast access to pertinent information (Ramayah & Aafaqi, 2004; El-Waily, 2015).

ISs and electronic libraries (e-libraries) give users incomparable opportunities to access a massive amount of scientific information in digital format (Umukoro & Tihamiyu, 2017). This tool can give access to improved service, compared to traditional libraries (Schwartz, 2000; El-Waily, 2015). According to Umukoro and Tihamiyu (2017), e-libraries provide electronic services, highlighted among them e-references, e-journals, bibliographic catalogue, etc, to the academic community through IT such as the Internet, the World Wide Web (WWW), mobile devices and others. While e-libraries benefit the academic community, these are complex systems that consume institutional resources and capacities (El-Waily, 2015). E-libraries have come to allow access to a massive amount of scientific information in digital format, which if not filtered can create a great deal of noise and lead to chaotic searching and use (Thong et al., 2002; Umukoro & Tihamiyu, 2017).

In a context of minimizing the budget attributed to education, HEIs are forced to manage their resources efficiently and effectively (El-Waily, 2015; Hinze et al., 2018). According to Resource-Based View (RBV) (Penrose, 1959; Wernerfelt, 1984, Barney, 1991), strategic choice is inevitably based on institutions' resources and their competitiveness also depends on the right choice of technological resources.

Then again, use and acceptance of the e-library, according to Social Learning Theory (SLT) (Rotter, 1942;1960) can be explained not only by the personality of each user, but also by factors related to the external environment. It is therefore necessary to identify and understand the critical factors leading to successful implementation, use and maintenance of e-libraries.

This situation calls for the creation of user-friendly interfaces, adjusted to users' needs (Thong et al., 2002). Consequently, HEIs must reconsider their strategy of implementing and supporting use of the e-library.

The possible need for library staff training can help to optimize students' use of the e-library (Thong et al., 2004; Vinyard, Mullally, & Colvin, 2017). However, the aspect of cost minimization can affect the success of this tool (El-Waily, 2015; Hinze et al., 2018).

In this context of introducing new IT, libraries are faced with the challenge of implementation, use and maintenance of this technology. Consequently, setting out from RBV and SLT, it is necessary to understand the problems and issues of IT involvement in “traditional libraries” and transformation of these entities in e-libraries, to be able to formulate strategies leading to their success (Ramayah & Aafaqi, 2004; Pembee, 2014; El-Waily, 2015). In order to clarify matters relating to traditional libraries becoming e-libraries, the main objective of this study lies in providing a wide-ranging vision of the factors of successful e-libraries in the HEI context.

This article is structured as follows. The second section presents a theoretical framework supporting the implementation, use and maintenance of e-libraries, based on RBV and SLT. The following section justifies the methodology used, describing the case study and the data-collecting instrument. Finally, the results are presented and discussed, together with the conclusions and implications, as well as suggesting future lines of research.

2. Literature Review

2.1 Resource-Based View (RBV) and Social Learning Theory (SLT)

In the present digital era, HEIs have invested major financial resources in a variety of IT, in order to provide functional electronic resources serving institutions’ purposes (Hinze et al., 2018). From a perspective of maximizing the profitability of resources, the Resource-Based View (RBV) assumes that organisations’ internal resources are their sources of competitive advantage (Penrose, 1959; Wernerfelt, 1984; Barney, 1991). According to Barney (1991), one of the main authors on this theory, resources should have the characteristics, value rarity, difficulty of imitation and substitution for them to become competitive advantages. The literature on RBV has classified resources in different ways or aspects (Franco & Haase, 2017). For example, Penrose (1959) proposed financial, technological, physical, human and organisational categories, while Barney (1995) classified resources in four categories: financial, physical, human and organisational. Barney (1991) also states that heterogeneous resources can be classified as technological, human and commercial.

Technological resources refer to the capability of electronic services, including an expressive amount of hardware, software, databases and communication systems to support these services (Chuang & Lin, 2017; Zhang & Hartley, 2018). Similarly, and according to RBV, efficient management of technological resources and IT can lead to HEIs’ success (Hu, Zhang & Zhang, 2006; Siswono, 2016).

The main unit of analysis of RBV is formed of the resources and capacities controlled by organisations, which include all their tangible and intangible attributes (Wernerfelt, 1984). Indeed, for Galbreath (2005), organisations’ success depends essentially on their resources.

According to Penrose (1959), resources are important due to the services they can provide, and in general, a single resource can be used to provide a large number of services, depending on how it is used. Therefore, the success of IT depends on how it is provided and the number of user needs this can satisfy (Hu, Zhang, & Zhang, 2006; Siswono, 2016) .

RBV also states that some resources can lead to reaching organisational goals. The fundamental challenge faced by organisations is identification of the resources that will lead them to achieving objectives and higher performance (Abubakar, 2017). In the same way, Pan, Pan and Lim (2015) suggest that IT and ISs have the potential to lead institutions to success.

Since early times, the notion of personality has undergone significant changes. Personality is defined as complex, as are all its intimately related components (Rotter, 1942; Özbek, Alımaçık, Koc, Akkılıç, & Kaş, 2014). Therefore, Social Learning Theory (SLT), developed by Rotter (1942, 1960), one of the pioneers in explaining learning, considers that the environment can control human behaviour. One of the fundamental aspects of this theory lies in the idea of expectations, i.e., an identical situation may not be considered in the same way by two individuals (Chen, Lu, & Wang, 2017).

Personality represents individuals' interaction with their environment, and we cannot speak of a personality, internal to the individual, independent of the environment. To understand behaviour, it is necessary to consider both the individual and the environment (Mischel, 1973; Nowicki, Iles-Caven, Gregory, Ellis, & Golding, 2017). According to SLT, understanding of the acceptance of IT may not depend only on individuals' personality, but also on the environment in which they use technology (Chiu, Chiu, Chen, Chi, & Chu, 2010). An individual's personality is not static. If the way people think and the environment change, behaviour will also change. However, the more life experience is built, the greater the effort and intervention needed for the change to occur (Nowicki et al., 2017). Rotter (1992) conceives individuals from an optimistic point of view, attracted by their objectives and seeking to maximize their efforts.

Following the evolution of SLT, Bandura (1962), one of the most quoted authors in the literature on this subject (e.g., Bethards, 2014; Chen, Wang, & Hung, 2015; Horsburgh & Ippolito, 2018), considers that learning takes place through individuals' observation and socializing. Here, IT is no exception, as learning and its acceptance also depend on the environment and direct observation of its use (Chiu et al., 2010).

2.2 Critical factors of successful e-libraries

Implementation of e-libraries

Technology is present in all aspects of society and a significant number of organisations use WWW, the internet and other IT as an effective means to provide services (Nugent et al., 2018). In addition, application of IT in processes inside organisations has come to facilitate stakeholders' access to, and use of information. Similarly, libraries are changing their concept and have also come to supply products and services in digital format (Umukoro & Tihamiyu, 2017).

Academic libraries have a rich history and heritage and have played an important role in both research and academic communication. They have evolved and developed together with HEIs and are characterised as resilient institutions easily adapted to changes of various kinds, whether social, political or technical (Weiner, 2005; Tait, Martzoukou, & Reid, 2016). At present, e-libraries are faced with an extremely dynamic technological environment. These platforms must have the capability to give a timely response to increasingly demanding academic users' needs (Nugent et al., 2018). From the researcher point of view, e-libraries can be seen as a set of collections in digital format with richer content and are also more functional than other information retrieval systems. Compared to traditional libraries, e-libraries have various advantages, highlighted among them the ease of accompanying resources stored in digital format, the speed of remote access to information and the flexibility of search techniques (Thong, Hong, & Tam, 2002).

In the evolutionary process of the digital world, academic libraries cannot be considered as simply databases of publications, but rather as resource centres for the learning process (Tait et al., 2016). Users' need for information has also diversified and continues to grow sharply. Consequently, libraries are implementing alternative ways of providing services, such as e-library platforms (Tait et al., 2016; Nugent et al., 2018).

However, the exponential growth in the demand for, and use of information has led to the problem of information overload (Omisore & Samuel, 2014; Nugent et al., 2018). Consequently, users find it difficult to locate the necessary information at the right time, and so there is a growing need for systems that filter and personalize scientific information according to users' interest. Here, the importance of developing user-centred platforms stands out (Omisore & Samuel, 2014; Pinho, Franco, & Mendes, 2018).

For university e-libraries to be able to respond to this concern and provide users with pertinent information, cooperation protocols have been established between various HEIs (Tebbetts, 2000; Schwartz, 2000; Alemna & Kantwi, 2004). This type of cooperation allows access to information held only by other institutions, through inter-library loans. HEIs have joined forces in order to provide their users with information that may not exist on their local database (Alemna & Kantwi, 2004). This exchange of books, articles and theses benefits

users. Without needing to move physically to other libraries, these agents, and the whole community, can access the e-library online and consult the document in question in digital format (Umukoro & Tihamiyu, 2017). This easy access to digital information has revolutionized teaching and allows research to be carried out more quickly and comfortably (Ciptayani & Dewi, 2017).

Implementation of the e-library implies financial investment in a variety of IT, in staff specialized in its installation and maintenance, and other aspects. However, a significant number of academic e-libraries do not have financial autonomy and a limited budget can affect the right decisions (El-Waily, 2015). Indeed, cost assessment carried out by HEI administration for the acquisition and implementation of the necessary infrastructure for a well-functioning e-library can be high (Yuhelmi & Rismayeti, 2017).

Installing this platform implies financial investment in hardware, which becomes out-of-date relatively quickly given the rapid development of IT, and software which can be owned or open source (Tebbetts, 2000; El-Waily, 2015). It is of note that open source software, although free, needs to be developed internally, in order to match users' needs. Therefore, whatever the type of software chosen to implement in the e-library, this will mean financial costs for the institution (Hinze et al., 2018). According to RBV, we can state that the resources selected for implementation of the e-library can lead it to higher performance.

The e-contents to be housed in the e-library are possibly the most relevant matter for library staff. Indeed, the cost of subscribing to periodicals consume a significant part of the budget attributed to the e-library in the long term (Tebbetts, 2000). Expenditure related to supporting the hardware, software and network, on which good functioning of the e-library depends, is also significant and must be reckoned with for implementation and maintenance of this tool (Tebbetts, 2000; Hsieh et al., 2014). In addition, the cost of library staff training can increase the total cost significantly (Thong et al., 2004; Vinyard, Mullally, & Colvin, 2017).

Use of e-libraries

The final users of the services provided by e-libraries may be a restricted community, if access is limited to certified users of the system rather than to internet surfers generally. At least, for certified users it is hoped the platform will have the capability to give rapid access to their area of work. So attention must be paid to matters of a technological nature, since connection to the e-library varies according to the speed and capability of the device employed by the user (Schwartz, 2000).

In general, e-libraries give users online access to an expressive amount of their resources in digital format. Without needing to physically move to the library, information is provided online and can be accessed from any fixed or mobile device with internet access (Thong et al., 2002; Umukoro & Tihamiyu, 2017).

For decades, the literature has sought the explanation and forecast of IT acceptance. In this scenario, both empirical and theoretical evidence suggests the Technology Acceptance Model (TAM) has the potential to explain human behaviour regarding the intention to use these tools (Davis et al., 1989; Devaraj, Easley, & Michael Crant, 2008, Altanopoulou & Tselios, 2017) and e-libraries are no exception (e.g., Thong et al., 2002; Ramayah & Aafaqi, 2004; Park et al., 2009; shidi et al., 2013).

Acceptance of e-libraries can depend on users' familiarity with this technology. Less successful searches can lead to obtaining undesired information. Here, users must master the key terms of the search (Thong et al., 2002; Park et al., 2009). So interaction between users and the e-library can lead to acceptance and use of this tool (Hong, Thong, Wong, & Tam, 2002). Furthermore, according to SLT, the environment can lead to changes in behaviour and therefore to users' acceptance of the e-library.

For correct use of e-libraries, the user interface (UI) must be appealing and functional, as this interface is the first contact between the user and the machine (Anyim, 2018). An appealing graphic presentation can create a comfortable virtual environment facilitating the identification of functions and help in navigation, making it easier to search more efficiently (Schwartz, 2000; Hong et al., 2002; Thong, Hong, & Tam, 2004). The ease of surfing in the e-library and sorting out relevant from non-relevant information depends on users' personal experience and can also lead to more effective searches (Thong, Hong, & Tam, 2004; Anyim, 2018).

Access to filtered information, which meets users' needs, may allow greater use of this tool, as access to a massive, disorganized amount of information can produce considerable noise in searches (Ezema, 2013). This situation can lead to discouraging the use of e-libraries, even with the easy access the tool provides (Thong et al., 2002; Umukoro & Tiamiyu, 2017).

The service provided by e-libraries may be little known by a significant proportion of academia. As a way to combat this situation, Makori and Mauti (2016) mention the need for HEIs to take action to publicise them among the academic community, so that there is greater knowledge and subsequently greater use of this tool. Little knowledge and non-visualization of the use of this tool can lead to greater resistance to use e-libraries. In this context of resistance, SLT considers that the environment in which individuals operate influences them in their choices (Rotter, 1942, 1960).

Support for library users to develop their skills in order to better explore the resources of these tools is a long-standing concern of many libraries and librarians (Allen, 1982; Tait et al., 2016). In the e-library context, library staff's assistance for users can be one of the conditions to facilitate good use of these platforms.

The availability of technical support can also lead to greater acceptance of e-libraries. The existence of a help-line and experienced, trained staff can contribute to a more effective e-

library (Thong et al., 2004; Park et al., 2009). If user training can solve doubts and fill gaps concerning the e-library's functioning and lead to these individuals' more efficient and effective use, also librarians, with greater knowledge of the tool, can publicise the functions of e-libraries more effectively. It is therefore necessary to develop multi-disciplinary teams who simultaneously have knowledge of IT and the needs of library staff (Park et al., 2009).

Older users who have not accompanied the digital revolution, despite having the potential to develop the skills to allow good human-machine interaction, are rather unfamiliar with IT, namely hardware, software and ISs, particularly regarding e-libraries (Thong et al., 2004). In order to reduce these users' anxiety and increase their confidence in using e-libraries, there must be well-trained librarian teams to help students use the platform (Thong et al., 2004; Vinyard, Mullally, & Colvin, 2017). Providing users with manuals or explanatory tutorials about how to use e-libraries can also be of benefit for searches and thereby improve the effectiveness of these platforms (Schwartz, 2000).

E-library maintenance

Since the 1990s, the exponential development of the internet and digital technology has allowed traditional libraries to be transformed into e-libraries. Paper documents have come to be replaced by publications in an electronic format, namely academic e-journals, e-books, e-theses, e-dissertations and e-papers (Hsieh et al., 2014). The popularity of the digital environment and the internet has influenced practically all aspects of academia and this has played a significant role in supporting research.

Today, the digital format is replacing paper documents, and consequently, e-libraries face the challenge of storing big data (Ezema, 2013). To cope with this situation, it is necessary to implement ISs that can handle a massive amount of information and contribute to spreading knowledge effectively. It is in this context that HEIs have invested in implementing and maintaining e-libraries (Makori & Mauti, 2016; Umukoro & Tihamiyu, 2017).

E-library maintenance, just like any other IS, requires investment in resources of various kinds. Among them are the costs of replacing hardware, updating software and those of training specialized staff to maintain these platforms (Tebbetts, 2000; Hinze et al., 2018). Although also necessary in the process of implementing and using e-libraries, training is no less important in the maintenance phase. Generally, in this phase bugs are identified or additional functions must be installed to make these platforms fully operational (Lockhart & Majal, 2012; Vinyard et al., 2017). In this context, when it is necessary to give a timely response to very specific needs, training plays a very relevant role in solving these issues. Here, HEIs are forced to provide the staff of their IT department with specialized training on this type of platform (Hinze et al., 2018).

3. Research Methods

3.1 Type of study and participants

Qualitative research is often used when it is necessary to investigate individual perceptions or human behaviour. These complex behaviours with a high degree of subjectivity would not be fully explained if resorting to quantitative methodology (Yin, 2015). In most cases, qualitative methodology is exploratory (Kelly, 2017). This approach should be adopted when little is known about the phenomenon to be studied, and besides, human sciences sometimes deal with phenomena that cannot be quantified (Gaikwad, 2017; Johnson & Rosenblum, 2018). Therefore, this study used qualitative methods to provide a broad view of the critical factors of success in implementing, using and maintaining e-libraries in the academic domain.

Within qualitative research, the case study method also aims to understand and explore complex events and contexts in depth and detail, giving answers to the “how” and “why” of interactions between the various factors originating the phenomenon studied (Yin, 2015; Gaikwad, 2017). In this particular study, the interactions between various agents in the process of implementing and maintaining academic e-libraries.

The case selected for this study was the e-library of the University of Beira Interior (UBI) in Portugal, and it was chosen due to this organisation’s focus on cooperating with other institutions. UBI is currently developing the digital part of the RIBBSE Project (Inter-Municipal Network of Libraries in Beiras and Serra da Estrela). This project aims to implement open-source document management software (*Koha*) and create a collective/shared catalogue for all libraries. Therefore, the RIBBSE Project has two major objectives (see <https://cimbse.pt/ribbse/>):

1. to equip all municipal libraries with an integrated *Koha* system that allows them, in some cases, to have a bibliographic management system which they lacked, and in other cases, reduce the costs involved in using commercial software.
2. to create an integrated catalogue allowing RIBBSE users to search in any library transparently, and in the near future to allow books to be requested from one of the other libraries. This project aims to create an inter-municipal library with an integrated catalogue that can direct requests to libraries in each local authority.

So the choice of case study was due to the importance this HEI gives to cooperation with other institutions and its experience already acquired in implementing and maintaining the UBI e-library. Another criterion in selecting this institution/university was greater access to the desired information.

3.2 Information collection and analysis

The empirical data for the exploratory study about the factors for successful implementation, use and maintenance of the e-library were obtained from interviews (primary data) and documentary analysis - service provision contract (secondary data) - and direct observation.

Data triangulation consists of combining different data sources aiming to prevent possible distortion in applying a single instrument. This procedure ensures in-depth understanding of the phenomenon in question and is a secure way to validate the research (Bekhet & Zauszniewski, 2012; Yin, 2015). Triangulation should also be seen as a complement rather than a dichotomy, as the weakness of each source can be compensated for by the strength of another technique (Bekhet & Zauszniewski, 2012; Sánchez-Gómez, Iglesias-Rodríguez, & Martín-García, 2016). Therefore, this study resorted to triangulation of the sources of information, namely (1) the interview, in which the questions referred to the success factors of e-libraries, (2) the contract to acquire a support service for an integrated library system for UBI and (3) direct observation. However, in qualitative studies, in the context of Social and Human Sciences, the interview occupies the prime position in the matter of gathering information (Gaikwad, 2017).

Before holding the interviews, the protocol (interview script) elaborated was pre-tested (see Appendix I) on 2 July 2018 with the person in charge of UBI's e-library. In this process, some shortcomings in the interview script were detected and corrected and the suggestions and observations made by this agent were taken into consideration.

Subsequently, from 9 to 23 July 2018, interviews were held with the staff of the library, Computer Services and Administration of UBI involved in implementing and maintaining the e-library (see Table 1). Ten interviewees participated in this research; 6 belong to the library staff, 2 to Computer Services and 2 to the institution's Administration. These actors were selected for the study as they have thorough knowledge of UBI's e-library and are involved in the process of implementing and maintaining this tool.

Table 1: Profile of interviewees

Function	Gender	Age*	Experience in the Post*	Academic Qualifications
In charge of Library services (A1)	Female	51	4	Master
Director of Computing Services (A2)	Male	52	13	Degree
Coordinator of the Technical and Document Treatment Sector (A3)	Female	60	3	Degree
Coordinator of the Reference / Desk Enquiries Sector (A4)	Male	58	3	Degree
Coordinator of the Inter-Library Loans Sector (A5)	Female	64	28	Degree
In charge of implementing the computing component of the RIBBSE Project (A6)	Male	32	1	Degree
Manager of the Institutional Repository (A7)	Male	45	3	Master
In charge of the Acquisitions, Offers and Donations Sector (A8)	Female	53	3	Degree
Lecturer and in charge of the Vice-Rector's Office for the Area of Research and Projects (A9)	Male	48	22	Ph.D.
Lecturer and in charge of the Vice-Rector's Office for the area of Finance, Human Resources and Social Responsibility (A10)	Female	49	26	Ph.D.

Observation: * represents age and experience in the post, in years.

According to Bardin (2011), frequently cited in qualitative studies in the area of Social and Human Sciences, content analysis is formed of three phases: (1) pre-analysis, (2) exploration of the material, and (3) treatment of the results, inference and interpretation. So according to the stages defined by that author, the first step was to make a general reading of the transcribed interviews in order to identify the topics/categories most frequently mentioned by the interviewees. In the next stages, the most relevant topics were identified and consolidated, through deeper analysis of the material and direct observation. Parts of the service provision contract were also referred to, to complement the information obtained.

4. Results and Discussion

4.1 Profile of the UBI e-library

Regarding online access to resources, UBI has implemented a bibliographic catalogue supported by open-source *Koha* software accessible through <http://catalogo.ubi.pt/> where authorized entities can access their area and check, among other functions, the state of requests for e-content made. UBI also provides a digital repository on <https://ubibliorum.ubi.pt/> which contains all the scientific production of researchers, lecturers and students of this institution. The repository has open access and is included in the Project of Open Access Scientific Repositories in Portugal (see <https://www.rcaap.pt/>). In addition, the institution provides the whole academic community with access to various databases (see <http://www.biblioteca.ubi.pt/Pagina/bases-de-dados>) included in a national consortium. Despite the tools already provided, in the future it would be desirable to implement a search aggregator including all the databases simultaneously.

4.2 Factors of the e-library's success

From content analysis and coding of the topics, various critical factors of e-library success were identified.

4.2.1 Minimization of costs

Cooperation protocols and use of open-source software

E-libraries provide their users with a vast range of resources in digital format, allowing them to complete their research successfully (Michalak & Rysavy, 2018). Similarly, and according to RBV, the management of organisations' resources can lead to these institutions having competitive advantages and maximizing their performance (Penrose, 1959; Wernerfelt, 1984; Barney, 1991).

In this context, the cooperation protocols established between UBI and various institutions have allowed the exchange of e-content at no additional cost. According to RBV, access to resources outside institutions can become a competitive advantage (Barney, 1991; 1995).

In this connection, the interviewees were unanimous in relation to the advantages provided by the cooperation protocols. The Coordinator of the Reference Sector (A4) considers that *"The procedure of loans between libraries is much faster. Through the network, readers can find out the state of the loan"*. The Coordinator of the Inter-Library Loan Sector (A5) goes further in her intervention, considering that *"We are a world library and all together we are*

just one library and the other libraries' resources end up also being our resources (between libraries with inter-library agreements). Sharing resources is very important in these times of crisis. We always turn to libraries we know and we have cooperation protocols with UBI".

Due to these protocols, access to information is processed more quickly. Interviewee A3 considers that *"Academia needs more immediate information. It's much better to be at the distance of a click than to have physical barriers and barriers of ownership rights, isn't it? At the time that suits them and when you are available, to have access to information you need is a great bonus. All this is possible just by using devices with internet access, for example, a mobile phone"*. According to the person in charge of the vice-rector's office for the area of research and projects, *"at present, these protocols are used for very particular work, since nowadays the university already has great bibliographic resources...and a lot more was already provided online, particularly for work with public access"* (A9), in agreement with what is stated by the person in charge of the vice-rector's office for the area of Finance, Human Resources and Social Responsibility (A10). Therefore, the empirical evidence obtained about the cooperation protocols agrees with the arguments of Tebbetts (2000), Schwart, (2000), Ball (2003), Alemna and KAntwi (2004) and Schmidt (2017).

In relation to minimizing costs and choosing between free or commercial software to implement UBI's e-library, the Coordinator of Computing Services (A2) states that *"Regarding software for bibliographic management, we began with Milénio, commercial software, whose licence was quite expensive, amounting to about 20 000 euros a year...we trained a technician who gave us sufficient guarantees to be able to cope on our own and so we cancelled the maintenance contract with that company and began to manage the software ourselves. At the moment, the cost of exploiting that software corresponds to 25% or 30% of human resources, which is not much more than we spent when we had Milénio. At present, after 5 or 6 years, we manage to gain practically what we paid for the annual licence. I think it was the right decision, and UBI has served as an example for other institutions nationally"*. According to the service provision contract analysed, it was confirmed that *"the costs of data migration and configuration carried out by the KeepSolutions company were in the order of 12 300 euros/year"*.

According to Bamgbade, Akintola, Agbenu and Ayeni (2015), in recent years, university libraries have increasingly invested financial resources, aiming to provide the whole academic community with good quality digital resources. Libraries have witnessed a major change in their focus, towards providing content in digital format. According to RBV, the right management of organisations' technological resources can lead to them achieving their objectives and competitive advantages (Penrose, 195), Hu, Zhang, & Zhang, 2006; Siswono, 2016).

Regarding the costs of implementing the e-library, the Head of Library Services (A1) says that *"When databases or commercial software is acquired, the costs are enormous, extremely*

expensive. Access for 3000, 4000, 5000, 6000.... 50 000 euros annually. On the other hand, we have free software, as in the case of our Koha. But we have to develop and maintain it, and the free nature of it is very relative. There are maintenance costs, the cost of conserving data, hardware costs, etc. In fact, there are associated costs, and no software is free". According to the person in charge of the vice-rector's office for the area of research and projects (A9), *"I agree and I am very much in favour of using free software"*.

The evidence obtained about the choice of open-source software to implement UBI's e-library leads to cost minimization in the long term, despite the initial cost of training staff for configuration and maintenance of the *Koha* software, in agreement with the conclusions of El-Waily (2015), Cobblah and Walt (2016) and Hinze et al. (2018).

4.2.2 Acceptance and use of the e-library

Ease of access to information, appealing UIs and actions to publicise the platform

According to Pandya and Darbar (2017), e-libraries have shortened stages in access to information, lowering physical barriers and thereby facilitating and speeding up the whole search and investigation process. In this connection, the Head of Library Services (A1) says that *"with the e-library, all the information necessary is only a click away"*. Similarly, the Coordinator of the Inter-Library Loan Sector (A5) states, *"being able to access the contents of the digital library without any physical barrier is of great benefit to the academic community. The ease of doing so eliminates barriers and makes the research process more agile"*. According to interviewee (A7), *"easy access anywhere allows greater freedom in research"*. Similarly, interviewee (A8) considers that *"easy access to the digital library brings great advantages for users. Using any device with internet access, you can access the resources provided by the library, anywhere and at any time"*, in agreement with the conclusions of Umukoro and Tihamiyu (2017).

Access to e-libraries, from devices with internet access has made it easier and quicker to obtain information (Al-Debei, Jalal, & Al-Lozi, 2013; Ouadoud, Chkouri, & Nejari, 2018). According to RBV, obtaining relevant, updated and timely information can lead organisations to success and competitive advantages (Penrose, 1959; Wernerfelt, 1984; Barney, 1991). For the person in charge of the vice-rector's office for the area of research and project, *"access to UBI's e-library allows international dissemination of the work produced in UBI, and thereby maximization of our research's impact in the world"* (A9). So the empirical evidence corroborates the literature on the ease of access to information provided by e-libraries (Tait et al., 2016; Vinyard, Mullally & Colvin, 2017).

The ease of navigation and finding the desired information, with no great effort, can lead to users accepting these platforms (Kim & Kim, 2016). The Coordinator of the Sector for

Technical and Document Treatment says that *“implementation of interfaces based on users’ needs would be of great benefit because less noise would be created in searches. But for this to happen, we should implement very appropriate software”* (A3). For the Manager of the Institutional Repository (A7), *“users need to have a more appealing interface, or according to their needs. In this way, they will have fewer difficulties in carrying out their searches”*. The empirical evidence obtained about intuitive UIs agrees with Thong et al. (2002), Baro, Eze and Nkanu (2013), Kim and Kim (2016) and Ji, Yun, Lee, Kim and Li (2017).

Greater visibility of platforms can lead to greater perception of their usefulness and ease of use (Lee, Hsieh, & Hsu, 2011). Here, SLT highlights the importance of the environment in which IT is operated (Chiu et al., 2010). Knowledge of the e-library and the functions it can supply to the whole academic community can lead to greater use of the tool. As stated by the Head of Library Services (A1), who considers that *“despite all the publicity we do as a library, the academic community is not informed about what they have available”*. The concern about publicising e-libraries expressed by interviewee A1 is shared by the person in charge of the Sector for Acquisitions, Offers and Donations (A8), who considers there must be *“greater publicity of the resources existing in UBI and the library services, which will help students in their searches and improve their research”* (A8). According to interviewee A1, *“one of the main efforts to publicise the functions associated with the e-library takes place when new students register. From 2015, the UBI library regulations have been provided in paper format, but now this information is conveyed verbally. UBI is one of the few universities in the country open 24 hours a day. This allows students continuous access to information, for example, via the wireless network and PCs available in the institution’s library”* (A1). This empirical evidence about the actions to publicise the e-library agrees with the conclusion of Turan and Bayram (2013) and Makori and Mauti (2016).

4.2.3 Training

Internal and external training of UBI staff

The change from traditional to digital resources in e-libraries meant changes in staff routines and implies greater knowledge of IT (Joint, Kemp, & Ashworth, 2000; Sharifabadi, 2006; Chiware, 2007, Kumar & Gupta, 2016). Digital formats predominate nowadays and changes in IT take place very rapidly. In this context, training means constant updating in IT and provides staff with updated knowledge of e-libraries to be able to improve their performance (Miwa et al., 2013; Frandsen et al., 2017). Here, RBV proposes that good management of human resources can lead to organisational success (Barney, 1991, 1995).

Internal training for UBI library staff means the transfer of knowledge between agents, and training is supplied from various sources. Continuous training from the Portuguese Association of BAD (Librarians, Archivists and Documentalists) to UBI agents is recurrent practice (see <http://apbad.pt/>). Through belonging to FCT (Science and Technology Foundation), library

staff also receive training through the B-on database, about the various areas related to librarian practice. In addition, in 2017, the employees of this institution had intensive training in English, to be able to give a better response to the problems of Erasmus students. Training of UBI students is mainly carried out by the head of this institution's library, and when requested by the different departments and in the classroom context.

This type of initiative aims to provide all UBI library staff with knowledge to be able to support all academia in carrying out their research and producing better scientific knowledge. Even if the institution's staff are not particularly keen on exploiting IT, despite intuitive UIs and easy navigation, training aims to fill this gap and give greater support to scientific production.

In the same line of reasoning, the Coordinator of the Sector of Technical and Document Treatment (A3) says that *"librarians' training did not consider the digital library, and so training is very important"*. This empirical evidence about the importance of training agrees with Bawden, Vilar and Zabukovec (2005), Baro, Eze and Nkanu (2013), Shem (2015), Kumar and Gupta (2016) and Frandsen, Tibyampansha, Ibrahim and von Isenburg (2017).

According to the person in charge of the Acquisitions, Offers and Donations Sector (A8), *"training is never too much, nor does it take up space, and it could help students to make better searches and save time, and for us it would also be useful to give better support to students who ask us for help"*. To optimize the results of searches, interviewee (A1) considers that *"in principle, the academic community is an informed community and should know how to search, should know how to use electronic resources, but that is not in fact the case. We, as the library, give the user training mainly on how to search"*.

Interviewee A3 goes further by considering that *"training should be held together with the staff of the library and the computing services. Ideally, there would be training of multi-disciplinary teams who with the existing resources were able to maintain and develop more functions of the digital library. Implementation of a search aggregator producing the least noise possible"*, agreeing with the statement by the head of the library (A1).

Nevertheless, the Coordinator of the Reference/Request Desk Sector (A4) contradicts the literature on the subject, by considering that *"people today manage to have easier access to knowledge, they have some mechanisms that allow them access to the platform without the need for more training"*. In the same line of thought, interviewee (A9) considers that *"to be effective and for mass use, the platform has to be simple to use...any platform that needs training will never be very successful"*. Therefore, the empirical evidence obtained is not consensual. According to the statements of interviewees (A4) and (A9) the role of training is not prioritized, also contradicting the literature on the topic.

4.3 Proposal of framework for successful e-libraries

Based on the empirical evidence obtained from content analysis, direct observation and analysis of the secondary data used, a set of factors stand out as leading to successful e-libraries. Therefore, a proposal for a framework (see Figure 1) is presented, with the success factors of e-libraries during the process of their implementation, use and maintenance.

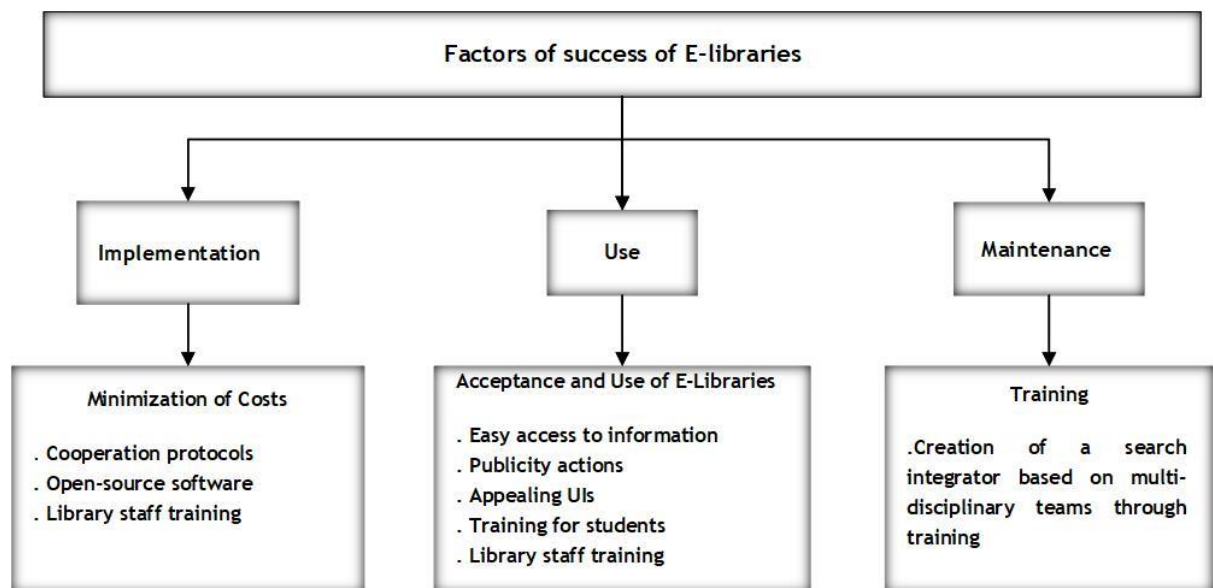


Figure 1: Success factors of e-libraries

5. Conclusions and Implications

The main aim of this study was to provide wide-ranging understanding of the success factors of e-libraries in the academic context, during the process of implementation, use and maintenance. Based on the empirical evidence obtained and the literature review carried out, the following critical success factors were identified: cost reduction, acceptance and use of the e-library platform and training. In the current scenario of reduced budgets allocated to HEIs, lowering the cost of installing the e-library becomes a determinant factor of its success. Also according to RBV, good management of organisational resources can lead to competitive advantages.

This study presents implications and evidence of use to anyone proposing to implement and develop this type of system. The results obtained suggest a potential strategy of minimizing costs in the process of implementing and using e-libraries, particularly choosing to use open-source software. Opting for commercial or open-source software is a central issue in implementing an e-library (El-Waily, 2015). Although the adoption of open-source software requires some development and consequently specialized human resources to develop and

maintain this tool, in the long term, this can be the right choice for UBI. According to RBV, which proposes efficient management of HEIs' technological resources (Hu, Zhang, & Zhang, 2006; Siswono, 2016), it can be concluded that the use of open-source software to implement UBI's e-library was the right strategy for successful implementation of the platform, and meant a reduction of the financial resources involved.

This study also shows that from a perspective of cost reduction, those in charge of HEIs should establish a greater number of cooperation protocols with their peers, so that, with the same resources, they are able to provide the academic community with a greater amount of e-content. Cooperation between libraries or library networks, after due implementation and consolidation of mechanisms and cooperation channels, will certainly mean better resource management, a more integrated experience for all network users, easier identification of needs and channelling of investment and training.

Training is also a factor that those in charge of HEIs should bear in mind in the process of implementing, using and maintaining e-libraries. Library staff training helps all academia to use this platform more effectively. Otherwise, the good functioning of the platform may be jeopardized. According to RBV, good human resource management can lead organisations to success.

Acceptance of this type of platform depends on various factors, namely, the ease of access to information, implementation of intuitive UIs appealing to users and training actions in respect to this tool. Easy access to information in the form of online e-content breaks down physical barriers, with greater comfort and speed for the user. Besides being attractive from the graphic point of view, the UI must also be functional to allow simple, intuitive navigation. In this way, the user is more likely to use it again. Furthermore, visual contact with the e-library tends to increase users' curiosity to try it out and explore its functions. So actions to publicise its potential are also an important factor for acceptance of this tool. Knowledge and visual contact with the use of this platform can increase its use, in accordance with the forecasts of SLT.

From the perspective of maintenance and development, it is suggested that HEIs should create multi-disciplinary teams able to develop the potential of the e-library, for example, through a search aggregator able to generate the least possible noise in searches.

From the theoretical point of view, this research contributes to enhancing the literature on this subject, presenting a framework identifying the success factors of e-libraries.

Although this study identifies the success factors of e-libraries and thereby contributes significantly to theory and practice related to the subject, it is not without limitations. A single case study, together with the subjectivity in interpreting responses, does not allow the generalization of conclusions. It is therefore suggested that similar studies should be carried out in the future, but applied in other geographical regions and in various contexts, to allow

comparative studies to be made. Also recommended is the development of instruments to measure the contribution of staff training and development to work performance in academic e-libraries. In this way, it would be possible to measure the impact of training on the performance of individuals and the institution itself.

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Appendix I

Interview script

The following questions will go towards carrying out research into the factors leading to the success of UBI's e-library, during the process of its implementation, use and maintenance. Your identity will not be revealed and we hope you will collaborate in this study.

- 1) In your opinion, what are the most relevant factors for the success of UBI's e-library?
- 2) State your opinion about inter-library loans. Do you consider them expensive, or beneficial for the academic community and for better functioning of the e-library?
- 3) What factors can lead to failure in implementing or maintaining the e-library?
- 4) Although there is still some resistance to use new technology and the digital library, in your opinion, what has already been done, or could be done, to overcome this situation?
- 5) What is your opinion about implementation of the e-library platform centred on users' needs? Do you consider beneficial the implementation of intuitive interfaces that are easy to use?
- 6) What is the role of training in use of the digital library? Do you consider it opportune or necessary? Can training lessen the problem of resistance to using the e-library?
- 7) Give your opinion regarding the costs associated with implementation and maintenance of the e-library.
- 8) In your opinion, what could be done to improve the effectiveness and efficiency of the e-library?

Chapter 6

Final Considerations

The main objective of this research was to reach better understanding of the role of ISs in the decision-making process and successful performance of HEIs, exploring the antecedents of technology acceptance. To achieve this objective, different studies/articles were elaborated serving as theoretical and empirical support to attain the specific objectives guiding the development and structure of the study.

6.1 General Conclusions

In order to fulfil the first specific objective proposed by this thesis, which aimed to identify, explore and systematize the main themes concerning the support given by institutional web portals to HEIs' information management, an SLR was carried out. Based on a theoretical body of 126 valid publications, the topics most dealt with in this area were identified: (1) software used in web portals, (2) internal and external benefits, (3) acceptance of technology and (4) management and storage of information.

To achieve the second objective, an empirical study was made, proposing to clarify the importance of web portals in supporting HEI management and these institutions' performance, considering the effect of individuals' acceptance of technology, through TAM and the Big-Five Model. The results of applying SEM allowed the conclusion that, contrary to what is claimed in the literature regarding the Big-Five Model (e.g., Rosen & Kluemper, 2008; Svendsen, Johnsen, & Almås-sørensen, 2013; Altanopoulou & Tselios, 2017), there is no relation of influence between personality traits and the perceived usefulness of institutional web portals in the case of teaching and non-teaching staff at Portuguese HEIs.

The personality traits construct was found to have a positive influence on teaching and non-teaching staff regarding the perceived ease of use of institutional web portals, thereby agreeing with the literature on this point (Svendsen, Johnsen, Almås-Sørensen, & Vittersø, 2011; Chang & Yang, 2013; Özbek, Almacık, Koc, Akkılıç, & Kaş, 2014; Chen, 2015). In turn, the ease of using web portals has a positive influence on the usefulness of this tool, and these two constructs influence their use positively. Given this empirical evidence, we can conclude

that use of the institutional web portals of Portuguese HEIs depends essentially on users' perception of their usefulness and user-friendliness.

This study also concluded on the existence of a positive influence between the use of web-portals and their quality. The quality of this tool also has a positive influence on decision support and HEI performance. Finally, this empirical evidence also confirms a positive relationship between the constructs of decision support and these institutions' performance. Here, it can be inferred that HEI performance depends essentially on web portals' support for the decision-making process (Guster & Brown, 2012; Zulkefli et al., 2016) and on the quality of the web portal (Al-Debei, Jalal, & Al-Lozi, 2013).

The third objective of this research was to identify the factors influencing the use of e-learning platforms in HEIs. To reach this goal, an empirical study was made using SEM. The results reveal that the characteristics of these platforms listed by IDT: relative advantage, compatibility, complexity, observability and trialability have a positive influence on the use of e-learning platforms by students at Portuguese HEIs. Similarly, the PIIT personality trait was also found to have a positive influence on the use of these platforms.

To achieve the fourth and final objective of this study, an empirical study was also made, aiming to identify the success factors of e-libraries implemented in the academic context. Through a case study of the e-library at the University of Beira Interior, it was possible to identify a set of factors determinant for the success of this type of IS, namely, cost minimization, the acceptance and use of e-libraries, and training. Staff training was found to be one of the factors with greatest weight in the success of this platform during the process of its implementation, use and maintenance.

6.2 Main contributions to theory

Concerning the contributions to theory, this research mapped the theoretical body of the literature on the role of web portals in supporting HEI management and identified the principal topics: software used in web portals, internal and external benefits of using web portals, acceptance of technology and information management and storage.

The Big-Five Model and TAM served as the theoretical basis to determine the influence of personality traits on the perceived usefulness and perceived ease of use of institutional web portals, and the influence of these two constructs on use of this tool. In this way, this research reinforces the existing literature on these models in the process of acceptance and use of web portals in the academic context.

The results of this study revealed that the characteristics of e-learning platforms stated by IDT (Rogers, 1962) and the PIIT personality trait (Agarwal & Prasad, 1998) influence the use of

e-learning platforms positively. Therefore, this research also strengthens theory about IDT and the PIIT personality trait through university students' use of e-learning platforms. This research concludes that e-learning platforms are more easily spread among HEI students if they have characteristics such as relative advantage, compatibility, complexity, observability and trialability, with PIIT also influencing use of this platform.

Furthermore, this research contributes to enriching the literature on ISs in the academic environment by presenting a framework identifying the factors of e-library success. The case study of UBI's e-library, aiming to identify and understand the success factors in the process of implementing, using and maintaining this tool, indicates a strong relationship between the factors of cost minimization, acceptance of the e-library platform and training in the success of this tool.

In this context, RBV (Penrose, 1959; Wernerfelt, 1984; Barney, 1991) had a fundamental role in this study, as it served as the theoretical basis to observe the use of different human and technological resources, with a view to improving the performance of the e-library studied. In addition, SLT (Rotter, 1992) was also shown to be important, since acceptance and use of the e-library can be explained by the visualization and imitation of other agents who use the platform. So everything indicates that the environment in which the e-library is used is determinant for its acceptance. RBV was also reinforced in the academic environment, since good management of human and technological resources in these entities leads to improved performance. The theory concerning ISs in the academic environment is also extended, through presenting a framework identifying the success factors of e-libraries.

An overall analysis, considering the quantitative and qualitative empirical results obtained in this research, allows the conclusion that the objectives initially defined were fulfilled, as the importance of the support provided by ISs, web portals, e-learning platforms and e-libraries for HEI administration was demonstrated, taking the effect of technology acceptance into consideration.

6.3 Main contributions to practice

According to Trieu (2017), efficient and effective information systems are of great value to institutions and can lead them to competitive advantages and improved performance. So according to the empirical evidence obtained in this research, insights that can lead to good performance of ISs in the academic context are now presented. This contribution to practice intends to alert all academic staff involved in ISs to good practices in implementing, using and maintaining this tool.

Good planning or preparation of an IS is recommended, since this is fundamental for its future success. In this phase there must be intervention by all the departments or sectors forming

HEIs, in order to make an exhaustive survey of these institutions' real needs, and so that the IS to be implemented meets individual and collective needs. After surveying the needs to be satisfied by the IS, the best software to use must be decided. There is a wide variety of open-source or commercial software on the market which can produce practically the same results. The choice of the type of software to be used and the whole IT infrastructure necessary to implement the IS depends basically on the financial resources the HEI has available. The know-how of staff in the IT/IS department is also a factor to consider in the process of implementing an IS, to decide whether this will be carried out by the institution's own staff or by an external entity.

In order to combat the weak acceptance of ISs, HEIs should resort to a number of strategies that can lead to increasing this. The development of flexible platforms adapted to the particular needs of each user can lead to greater acceptance of the IS, and consequently, to greater use of the platform (González et al., 2013). In addition, ISs centred on users' needs and with intuitive and visually appealing UIs may lead to greater acceptance of ISs by the various agents involved.

The ISs implemented should have various characteristics, such as relative advantage, compatibility, complexity, visibility and trialability, so that users will accept them and use them more easily. TAM also considers that perceived usefulness or relative advantage and complexity or perceived ease of use are determinants of IT acceptance. Similarly, the implementation of useful ISs, that are easy to use, can lead to greater use of this platform.

The limited knowledge about the ISs provided by HEIs or their potential can lead to their diminished use. To combat this situation, it is suggested that those in charge of HEIs should carry out publicity actions directed to the main stakeholders involved (principally students, teachers, support staff and top management), to inform academia about the tools available and the potential of each. The role of training must also be highlighted, both in the domain of IS acceptance and use, and concerning the maintenance of these platforms.

Finally, it is important to mention the importance of the quality of information in ISs as an essential factor to consider at the time of their implementation. The information must be up-to-date and relevant, and above all serve HEIs' purposes. In this way, the information provided by ISs can contribute to supporting the decision-making process and consequently to the improved performance of these institutions.

Overall, these insights can lead HEIs not only to correct implementation of ISs, but also to greater acceptance of this tool by academia in general. Consequently, administration in these institutions can have access to up-to-date information which reflects their true situation as well as possible, and allows more conscious, informed decision-making.

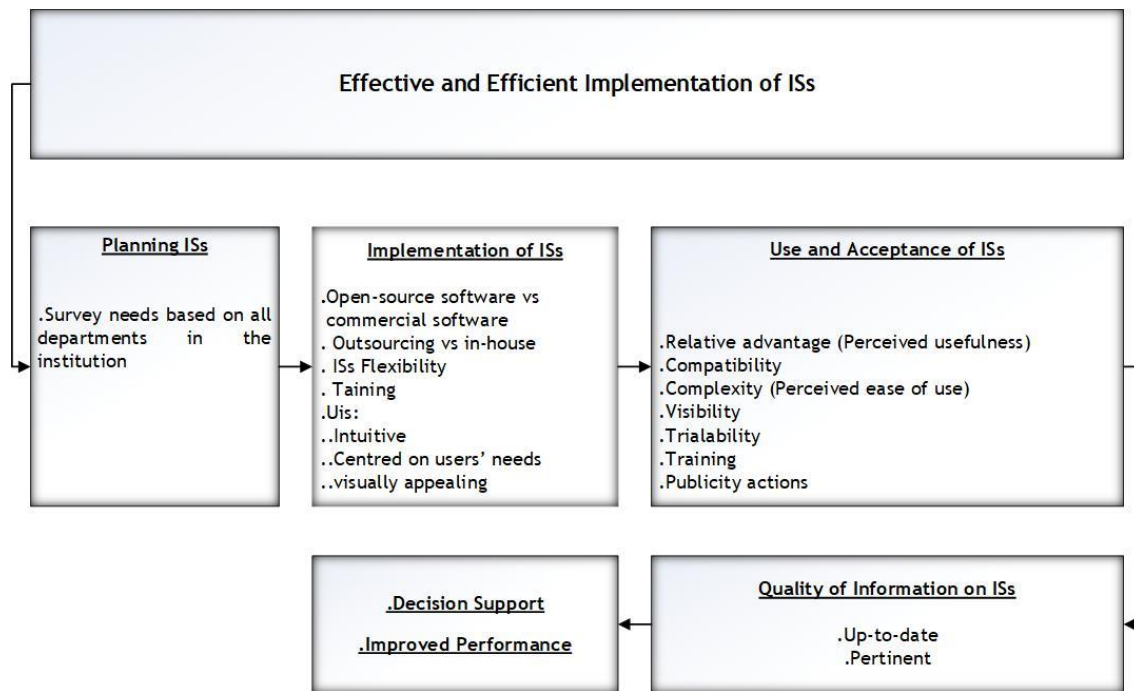


Figure 1: Insights for efficient, effective ISs

6.4 Limitations and future lines of research

One to the limitations of this research concerns the generalization of results, since they originate in some Portuguese HEIs only. Despite the national coverage, involving HEIs in the different regions of the country (north, south and centre), future research could involve all Portuguese universities, as well as those from other countries, in order to make a greater contribution regarding the support ISs give to HEI management. That broader sample, covering HEIs in other countries, with different cultures, would allow comparison of the evidence found here with that of other contexts. This could allow greater generalization, or identify differences and factors that could modify the relationships studied.

Also suggested for the future are studies seeking to understand the appropriateness and necessary extent of training for the various actors interacting with e-learning platforms. In this way, it might be easier to understand the individual needs of each user and so maximize the effect of training actions. In this context, developing instruments to measure the effectiveness of training seems extremely relevant, to make it possible to assess the effect of training on IS and in the relationship with work performance by individuals and HEIs themselves.

It is also proposed that the model presented in the third chapter (see Figure 1) should be applied in different contexts. That model investigates the relations of influence between personality traits and perceived usefulness and perceived ease of use and IS use, besides confirming a relationship between the quality of information in the IS and decision support

and HEI performance. In this way, it would be possible to compare the results obtained in different contexts and allow better understanding of individuals' personality traits. Also suggested are comparative studies between state and private HEIs, given the considerable differences between these types of institution, particularly in terms of resources and objectives.

Future research could carry out more case studies, considering their advantages over other methodologies (namely, the possibility of accompanying phenomena), but applied to other geographical contexts.

The future lines of research presented provide opportunities for deeper study of this subject matter.

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